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NAVAL POSTGRADUATE SCHOOL
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THESIS

**THE IMPACT OF MATRIX STRUCTURE AND
SELF-MANAGED TEAMS
AT THE NAVAL AIR WARFARE CENTER,
AIRCRAFT DIVISION, INDIANAPOLIS**

by

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December, 1993

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94-08438



DTIC QUALITY INSPECTED 1

94 3 15 024

Unclassified

Security Classification of this page

REPORT DOCUMENTATION PAGE

1a Report Security Classification: Unclassified			1b Restrictive Markings		
2a Security Classification Authority			3 Distribution/Availability of Report Approved for public release; distribution is unlimited		
2b Declassification/Downgrading Schedule					
4 Performing Organization Report Number(s)			5 Monitoring Organization Report Number(s)		
6a Name of Performing Organization Naval Postgraduate School	6b Office Symbol (if applicable) *36		7a Name of Monitoring Organization Naval Postgraduate School		
6c Address (city, state, and ZIP code) Monterey CA 93943-5000			7b Address (city, state, and ZIP code) Monterey CA 93943-5000		
8a Name of Funding/Sponsoring Organization	6b Office Symbol (if applicable)		9 Procurement Instrument Identification Number		
Address (city, state, and ZIP code)			10 Source of Funding Numbers		
			Program Element No	Project No	Task No
			Work Unit Accession No		
11 Title (include security classification) THE IMPACT OF MATRIX STRUCTURE AND SELF-MANAGED TEAMS AT THE NAVAL AIR WARFARE CENTER, AIRCRAFT DIVISION, INDIANAPOLIS					
12 Personal Author(s) Gary D. Houglan, Lieutenant Commander, United States Navy					
13a Type of Report Master's Thesis		13b Time Covered From To		14 Date of Report (year, month, day) 1993 December 16	
				15 Page Count 133	
16 Supplementary Notation The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.					
17 Cosati Codes			18 Subject Terms (continue on reverse if necessary and identify by block number)		
Field	Group	Subgroup	Naval Air Warfare Center, Organizational Effectiveness, Matrix Organizations, Self-Managing Teams		
19 Abstract (continue on reverse if necessary and identify by block number)					
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20 Distribution/Availability of Abstract <input checked="" type="checkbox"/> unclassified/unlimited <input type="checkbox"/> same as report <input type="checkbox"/> DTIC users			21 Abstract Security Classification Unclassified		
22a Name of Responsible Individual Professor Gail F. Thomas			22b Telephone (include Area Code) (408) 656-2756		2c Office Symbol AS/FA

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted

security classification of this page

All other editions are obsolete

Unclassified

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THE IMPACT OF MATRIX STRUCTURE AND
SELF-MANAGED TEAMS AT THE
NAVAL AIR WARFARE CENTER, AIRCRAFT DIVISION, INDIANAPOLIS

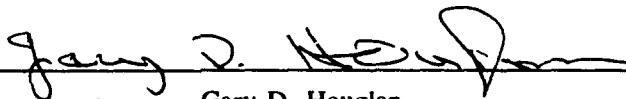
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Submitted in partial fulfillment
of the requirements for the degree of

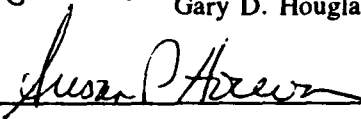
MASTER OF SCIENCE IN MANAGEMENT
from the
NAVAL POSTGRADUATE SCHOOL
December 1993

Author:

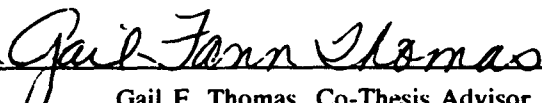


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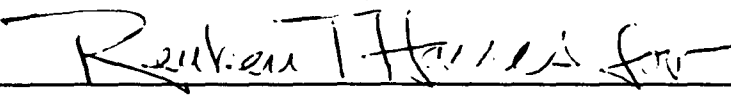
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ABSTRACT

This thesis evaluates the impact of the Naval Air Warfare Center, Aircraft Division, Indianapolis (NAWC-ADI) efforts in restructuring itself using a matrix structure and self-managed teams. The thesis provides background information describing the organizational change and a review of pertinent literature regarding organizational structure, matrix organizations, self-managed teams, and intra- and inter-team dynamics. Data were collected using in-depth interviews of 55 personnel conducted at NAWC-ADI. The results identified themes about what is working well such as team members being better able to implement solutions, they are more self-sufficient, they are better able to solve problems without going through the organizational hierarchy, team members are able to identify with the whole organizational process, some teams members are developing intra- and inter-team skills, and that corporate information is being disseminated adequately. The results also identified themes regarding the challenges at NAWC-ADI related to the implementation of the matrix organization and self-managed teams. These include difficulty with intra- and inter-team skills and the adjustment of the formal flow of communication to the new organization. The conclusion section addresses recommendations for NAWC-ADI management in meeting its remaining challenges and suggestions for further research.

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DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution # _____	
Availability Codes	
Dist	Avail and/or Special
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TABLE OF CONTENTS

I.	INTRODUCTION	1
A.	OBJECTIVE AND RESEARCH QUESTIONS	1
B.	ORGANIZATION OF THE THESIS	2
II.	BACKGROUND	3
A.	DESCRIPTION OF NAWC-ADI	3
B.	ORGANIZATIONAL STRUCTURE	4
C.	THE LEVERAGE MODEL	9
D.	PREVIOUS ORGANIZATIONAL STUDIES	15
III.	LITERATURE REVIEW	19
A.	ORGANIZATIONAL SYSTEMS MODEL	20
B.	MATRIX ORGANIZATIONS	25
C.	SELF-MANAGED WORK TEAMS	39
D.	HYPOTHESES	48
IV.	METHOD	50
A.	DATA COLLECTION	50
B.	DATA ANALYSIS	52
V.	ANALYSIS	55
A.	INTRODUCTION	55

B. POSITIVE EFFECTS OF THE NAWC REORGANIZATION . .	55
C. CHALLENGES STILL FACING NAWC	73
D. SUMMARY	99
VI. CONCLUSIONS AND RECOMMENDATIONS	104
A. MANAGEMENT	104
B. FURTHER RESEARCH	109
APPENDIX A	112
APPENDIX B	113
APPENDIX C	114
APPENDIX D	115
APPENDIX E	119
APPENDIX F	121
LIST OF REFERENCES	122
INITIAL DISTRIBUTION LIST	126

I. INTRODUCTION

The Naval Air Warfare Center, Aircraft Division, Indianapolis, Indiana, (NAWC-ADI) commissioned a Naval Postgraduate School (NPS) team to conduct an assessment of its organizational communication processes. Having undertaken a significant reorganization in April 1992, upper level management felt that communication gaps were adversely affecting work effectiveness. The research of which this thesis is a part examines communication processes as evidenced by semi-structured interviews and questionnaire data obtained from NAWC-ADI employees. Two theses have been collaboratively prepared as part of this research activity and have common background and literature review chapters. The qualitative data obtained from interviews is the focus of this thesis; the quantitative data is the focus of the other (Ford, 1993).

A. OBJECTIVE AND RESEARCH QUESTIONS

This thesis will examine the perceived impact on NAWC-ADI's organizational dynamics resulting from the transition of NAWC-ADI from a bureaucratic structure to a matrix structure using self-managed teams. The research questions are as follows:

- How has the matrix structure affected NAWC-ADI?
- How is the move to self-managed teams affecting NAWC-ADI?

B. ORGANIZATION OF THE THESIS

This thesis is divided into six chapters. This chapter is followed by Chapter II, which provides a comprehensive background for NAWC-ADI, its organization, and an overview of recent research conducted in the organization. Chapter III is a review of the literature pertinent to this study. Chapter IV describes the qualitative methods used to analyze the interview data. Chapter V outlines the results of the qualitative analysis. Conclusions and recommendations are delineated in Chapter VI.

II. BACKGROUND

A comprehensive background of NAWC-ADI is provided in this chapter, including a description of its current mission, organization-wide structural changes, and relevant research done within the organization since the restructuring. The objective is to provide a context to frame the environment in which this research was conducted.

A. DESCRIPTION OF NAWC-ADI

NAWC-ADI was first established as a Naval ordnance plant in 1942. Since that time, it has developed into the Navy's primary research and development organization for advanced aviation electronics (avionics). NAWC-ADI is one of the commands within the Naval Air Warfare Center organization under the control of the Naval Air Systems Command (NAVAIR). An organization chart is provided in Appendix A. While NAWC-ADI does have contracts with the U.S. Marine Corps, Army, and Air Force, the majority of their contracts come from Naval Aviation. NAWC-ADI is involved with integrated avionics management, engineering, acquisition, technology insertion, and manufacturing. These enterprises include pilot and emergency production, electronic system design, transition to

production and manufacturing, and data documentation for commercial production.¹

NAWC-ADI's facilities include a 14-acre main building, a 621,000 square foot manufacturing/assembly facility and \$350 million of capital equipment. The majority of the 3,200 civilians in the work force consists of engineers, scientists, technicians, and skilled craftsmen.

As a previously operated Naval industrial fund site, NAWC-ADI now operates as a Defense Business Operations Fund (DBOF) activity. The funding for NAWC-ADI comes directly from the contracts it has with Department of Defense (DoD) organizations. This funding arrangement requires NAWC-ADI to operate in a buyer-seller relationship similar to private industry. Only by obtaining new contracts or meeting the performance requirements of existing contracts can NAWC-ADI receive funds to operate. Therefore, productivity and effectiveness are critical to NAWC-ADI's existence.

B. ORGANIZATIONAL STRUCTURE

Prior to April 1992, NAWC-ADI's organizational structure was typical of most military industrial activities; a functionally organized system with a strong vertical hierarchy.

Within this structure, each department operated as a "vertical chimney" with separate agenda, priorities, and

¹Information from NAWC-ADI's Command Information Pamphlet

organizational values. With the existing barriers between departments, each director and manager approached corporate strategy achievement by making operational decisions solely from their functional orientation. Communication and coordination flowed vertically, along the established chain-of-command, but barriers between departments inhibited lateral, inter-department communication and coordination. (Meier, 1992)

The command structure included an executive level with special assistants for staff responsibilities and ten separate departments for the operational or industrial functions (see Appendix B). Communication from upper-level management filtered down through department heads and supervisors to the employees, and upper-level management was informed of current events only after many layers of managers filtered the information.

In October 1991, faced with the growing pressure of widespread changes within the Department of Defense, the Commanding Officer and Executive Director established a steering team to develop a new organizational concept of operations. This team was given this guideline: The organization must be process-oriented and customer-driven.

The steering team consisted of mid-level managers. The team used the "Leverage Process" provided by a management consulting firm, The Leverage Company (Greenwich, CT), which had consulted with NAWC-ADI on specific issues in the past. The Leverage process will be described in detail in section C. With the Leverage Process as the basis of their planning model, the steering team recommended that the best method for

improving NAWC-ADI's organizational effectiveness and to meet its long-term goals was to implement a command-wide matrix organization.

The Commanding Officer and Executive Director concurred with the recommendations and began to plan for the transition to a matrix command structure. Four senior civilians were selected as Avionics Group Organization (AGO) Directors. These individuals were tasked with developing an implementation plan. The Executive Officer was tasked with developing a plan to incorporate the Command Staff offices and special assistants into the new organizational structure.

Under the reorganization, one side of the matrix is comprised of three Directorates: Design (Alpha); Acquisition and Manufacturing (Beta); and Fleet/User Support (Gamma). Appendix C provides a complete organizational diagram. These directorates were further broken down into Competency Centers (CC). These centers are responsible for providing project teams with the resources (material, manufacturing, and personnel) to meet project commitments. Additionally, the centers are responsible for the development, training, and administrative requirements of the employees within their competency center.

The reorganization also created a Project Office, forming the second side of the matrix. The Project Office is subdivided into four areas: Avionics (A), Anti-submarine Warfare (B), Platforms (C), and Weapons Avionics (D). Each of these

sub-areas contains multiple projects. These projects are coordinated by a Project Leader (PL) who is tasked with overall project success. The PL receives team members and other resources from the various competency centers that impact the specific project.

The Project Teams are temporary (though often long-term) assignments, terminating when the project is complete. Competency center personnel can be assigned to multiple projects if their time is not fully used on a particular project. At the end of a project, team members return to their competency centers until they are reassigned a new project. In the competency center the employee receives training, works on support teams to assist with other projects, or is temporarily assigned to other competency centers.

The Competency Center Directors and Project Leaders are assisted by a Competency Center Management Team (CCMT) comprised of a Process Improvement Associate (PIA), Personnel Development Associate (PDA), Master Scheduler (MS), and a Futurist. These individuals provide the interface between the competency centers and the project teams, as well as between the various organizational levels. Levels one, two, and three refer to the horizon perspective of the position. For example: the AGO is considered Level 3 and is concerned with far-horizon issues (1-2 years); the Competency Center Directors and Associates are Level Two and are concerned with

mid-horizon issues (30 days to 1 year); the Project Leader and team members are Level One and are concerned with near-horizon issues (1-30 days).

The decision to implement the new organization in April 1992 was based on the Commanding Officer's upcoming change-of-command. It was felt by the Commanding Officer and Executive Director that the new Commanding Officer would be unable to "get up to speed" quickly enough to implement the reorganization before the momentum was lost. The initial implementation was swift. On 14 April, NAWC-ADI was a vertically driven organization. On 15 April, it was a horizontally driven organization.

The Executive Officer completed the reorganization of the Command Staff and special assistants in June 1992. He was given this extra time for two reasons: (1) The staff offices were critical in ensuring the smooth reorganization of the rest of NAWC-ADI in April; and (2) the primary mission of the old and new Command Staffs were not radically different, so the impact of a more gradual reorganization would be more manageable.

The reorganized Command Staff consists of six centers;

- Human Resource Office - formerly Personnel, this center is tasked with people and program development, work force data keeping and personnel actions
- Group Planning - this center conducts special studies, investment and work load analysis, and develops organizational goals and objectives.

- Group Ethics - this center aids in the study of group processes at NAWC-ADI.
- Infrastructure, Health and Safety, and Security Support - this center is in charge of operations and military support, facilities maintenance, safety and security, material management, and legal support.
- Financial Management and Business Services - this center takes care of the accounting, budgeting, project and management support, and planning and resource integration.
- Group Communications - Given the radical nature of the change, this area was tasked with developing and maintaining a system of communications between and within all the many newly-created teams.

C. THE LEVERAGE MODEL

The steering team in charge of developing a new concept of operations chose the "Leverage Process" provided by the Leverage Company (Greenwich, CT) as a model to follow in their restructuring effort. This production-based model provided them an ideal restructuring tool to accomplish their objectives of being a process-oriented, customer-driven organization. To understand the structural issues facing NAWC-ADI, a more detailed description of the leverage process is provided

1. Pipeline Organization Model²

Leverage predicts that successful corporations of the 21st century will be determined by how well corporate leaders

² The Pipeline Model and Leverage Change Process is taken from a paper titled "The Leverage Company" submitted as a class project for MN 4125 by Gary D. Houglan. Additional information has been included in these two sections to better describe Leverage's organizational processes and constraints.

use strategic plans to manage resource rationing, structure their organizations around "value-adding flows," re-engineer pipeline processes, and effectively use performance goals and measures.

Leverage's organizational model is concerned with two resource rationing processes. First, corporations must ration their focus on organizational competencies. As the rate of technological change increases, organizations will not be able to invest in all of their business areas at the same time. If they tried, it would result in uneven development and performance. Large organizations cannot expect to be the industrial leaders in all of their the present enterprises.

Companies must identify which of their competencies are core or strategic, and justify reinvestment, and which competencies are non-core or non-strategic, and must be let go (Nickerson, p.1).

By identifying their core competencies, corporations are better able to maximize the essential processes within their organization. Second, resource rationing must include an analysis of the constraints that most significantly affect obtaining organizational (strategic) goals in the core competencies. Leverage's model discriminates between four categories of constraints: physical, logistical, managerial, and organizational/behavioral.

Constraint identification is used to determine what is blocking process improvement. The following is a description of the four types of constraints.

- **PHYSICAL CONSTRAINT:** an asset, facility, or capability that cannot meet market demands for quality or quantity, as it is currently operated.

- **LOGISTICAL CONSTRAINT:** a system or procedure by which work is planned, scheduled, assigned, moved through its value-adding steps, inspected, counted, inventoried, shipped and serviced. Logistical constraints cause disrupted flow, long queue times, and unclear ownership of the work in process.

- **MANAGERIAL CONSTRAINT:** a policy, strategy, leadership style, or performance measurement that is used to manage the business, which itself causes the company's change process to slow down or stop. Managerial constraints usually stem from looking at local unit needs in isolation from the dynamics of the entire business.

- **ORGANIZATIONAL OR BEHAVIORAL CONSTRAINT:** Behavior here means "the way we carry out our duties." Usually, when an individual or group acts in a way that slows the change process, they believe they are doing what the business needs or expects them to do. Few people sabotage a change process deliberately. Many do so without realizing it because they do not understand the role they must play for change to be successful. The most universal ROOT CAUSE for such behavioral constraints is an organization structure which does not clearly define roles and responsibilities, and an organization culture which does not require individual accountability. Because these behavioral and organizational forces are inseparable, we combine them in this category of constraints (Naval Avionics Center, p.8).

Leverage summarizes this resource rationing process as follows:

To apply constraint theory, a company must first set goals for competitive performance in the eyes of major customers, define metrics to use for tracking performance against goals, and then force-rank possible constraints to achieving those goals within the time-frames required. It is important to select only one or two top constraints on which to focus resources and investment. Think of these top constraints as leverage points, where the most

progress can be made for the lowest investment (Nickerson, p.1).

Central to Leverage's organizational model is the structure of the organization. To effectively address pipeline velocity, organizational processes must be networked among all competency areas involved with the work process. The structure that best supports this networking is a horizontal organization. By eliminating the hierarchical structure within an organization, the functional barriers that impede resource allocation, process design and organizational goal accomplishment are similarly eliminated. The horizontal organization allows for flexible resource allocation (capital and personnel), and moves the decision-making closer to the actual work process pipeline.

Resource rationing and organizational restructuring will lead corporate leaders to the essential work processes to be managed. The task then becomes process re-engineering. Leverage identifies three primary processes that corporations will re-engineer: Value-adding pipeline processes, decision processes, and information processes.

The value-adding pipeline process concentrates on the specific product/service process that is the basis for the organization. In NAWC's case, this covers the entire process of identifying customer need to the receipt of the material by the customer. The decision process involves how the firm organizes to balance the demands and supplies of the

organization. It also addresses technical and capital investment issues, personnel development processes, and establishes priorities for process improvement within the organization. The information processes are viewed as the established formal networks to facilitate information flows (such as organizational policy and direction, project team inter-communication, and communication between teams and with organizational leaders).

Keeping the customer's requirements as the focus, the re-engineering is to be done by the people involved with the process ("who own the process"). The re-engineering must account for "quality, speed, flexibility, high asset utilization, rapid cash flow, reliance on value-adding workers to make decisions, and use of information networks by all team members". (Nickerson, p.1)

2. Leverage Change Process

A flow chart of the Leverage Change Process is provided in Appendix C. The process basically consists of three phases; (1) problem identification and analysis, (2) solution determination and test, and (3) making the required changes happen. A flow chart of the Leverage Change Process is provided in Appendix C. The process starts with the Continuous Improvement Team (CIT) identifying and analyzing the problem. The CIT must decide why a change is needed in the organization. It develops the "optimal/metrics" for the overall organization. This vision is compared to the present

to provide a baseline assessment. The CIT identifies the top three leverage points or constraints that will limit the move from the present baseline to the optimal. They determine who is accountable based on the process involved and the horizon affected by the change. The CIT defines a charter (Plan of Actions and Milestones (POAM)) to specify goals, targets, start and end dates, and what the metric will be.

The process is then taken over by the Continuous Improvement Action Team (CIAT) to determine and test solutions. The CIAT is concerned with an individual effort to change a process rather than the overall organization. As with the first phase, the CIAT identifies why this particular change is needed, the optimal/metric, the present baseline, and the top constraints to obtaining the optimal outcome. The CIAT then market tests the constraints analysis by obtaining feedback from the users and owners of the process. A plan for managing the constraints is developed to eliminate the root causes preventing the achievement of optimal implementation. An accountability map identifies who owns the process, who is responsible for the change and who the implementers will be. An implementation plan works out the details of how the change will be implemented. The implementation plan is market tested to determine the effect of the proposed change on the work force and to obtain feedback to refine the implementation plan's POAM and measures.

The third phase is managed by the implementers. First, they pilot test the plan, gather data, and change the plan as necessary. Second, the final plan is implemented and monitored. This process can expand the implementation as new data is identified and it continues to monitor and analyze the measures of the plan. Third, the implementers monitor and address any emerging constraints that may develop that were not part of the original implementation plan. At this point, the process begins again with the next constraint identified for this particular effort.

D. PREVIOUS ORGANIZATIONAL STUDIES

Two sources of organizational information obtained since the reorganization provided additional background to this research. These were a Quality of Work Life (QWL) Survey conducted by NAWC-ADI's Human Resource Office in November 1992 (Hocavar, 1993) and an Employee Feedback Survey (EFS) conducted by NAWC-ADI's Corporate Communications Office in September 1992. (Byron, et al, 1993)

The Quality of Work Life Survey provided information concerning job satisfaction, training, equity and rewards, teams and cooperation, factors impacting ability to do one's job, organizational support for doing things differently, and organizational values and trust. A 57% response rate (402 returned out of 700 distributed) was achieved for the randomly selected sample. Results were separated into three sections;

items with the greatest dissatisfaction, items with the greatest satisfaction and open-ended question results.

Items with the greatest dissatisfaction were as follows:

- Participation and planning and policy making
- Management team concern for employee well-being
- Clarity of employee job responsibilities
- Acknowledgement of employee contributions
- Fairness of work assignment
- Ethics and moral values at the Center
- General satisfaction
- Feelings about careers at NAWC-ADI (Hocevar, p.18)

Items with the greatest satisfaction were as follows:

- Meaningfulness of my job
- Valuation of training
- Being informed of the Center's mission/goals
- Center encouragement for other's task completion
- Employee support for the CST concept (Hocevar, p.18)

The open-ended questions in the survey were grouped into two categories; QWL concerns and the impact of restructuring on performance. QWL concerns were:

- Job security and the future of NAWC-ADI
- Lack of clarity regarding career opportunities
- Concerns about promotion fairness
- Communication and clarity of direction particularly regarding the restructuring
- Concerns about leadership and management. (Hocevar, p.17)

The reorganization was seen to have affected the following areas: "lack of role clarity, excessive meetings, too much work as well as too little work, and problems with communication." The reorganization was seen to have improved the following areas: "Removal of barriers allowing greater coordination, opportunities for self-initiative and innovation, and self-management." (Hocevar, p.17)

The Employee Feedback Survey (EFS) questions were divided into three sections; personnel information, organization's structure/objectives, and organization's implementation. The survey was completed by 179 randomly selected employees at NAWC-ADI. An NPS work team grouped the questions into four areas; reorganization, involvement, effectiveness, and communication. The involvement group had the most positive mean, and was comprised of questions designed to evaluate a respondent's sense of belonging to the organization. The effectiveness group had the most negative mean, and asked respondents to agree or disagree with various statements concerning accountability, personnel development, and confidence in top management.

Items with the greatest disagreement were as follows:

- I participate in the decision making process.
- The organization eliminates internal communication and cooperation barriers.
- The Competency Centers provide effective personnel skill development opportunities.

- The organization provides opportunities for career development and advancement.

Items with the greatest agreement were as follows:

- More teamwork is occurring.
- Teamwork makes others successful.
- The organization's primary focus is customer satisfaction.
- Having a single point of contact for the customer results in better communication. (Byron, 1993)

Both of these surveys identified areas of concern for NAWC-ADI. The apparent lack of information regarding career development opportunities and basic job responsibilities is mentioned several times, along with a general feeling of communication deficiency and being excluded from the decision making processes at the center. These themes are used by the researchers in the development of an Organizational Effectiveness model that forms the foundation for the current research activity.

III. LITERATURE REVIEW

As stated previously, NAWC-ADI identified, through the Leverage Process, that its organizational structure was the major constraint to improving organizational effectiveness. Since the reorganization, NAWC-ADI has become concerned that their communication processes were not operating effectively. A systems approach was chosen to examine NAWC-ADI's organizational components that allow the researcher to observe how the structural change may have affected different systems components including communication processes. Without alignment between its components, an organization will be unable to optimize its effectiveness.

A brief description of systems models will provide a context for examining the primary structural changes that have been implemented at NAWC-ADI: on matrix organizational design and self-managed teams. The matrix section will discuss structural configuration in regards to employee reactions, and possible inefficiencies within matrix organizations. It will identify the need to match organizational norms and values with the matrix structure. Additionally, the preferred basic conditions for a matrix organization, the need for an assimilated organization (of structure, systems, culture and behavior), the characteristics of mature matrix organizations

and the personnel in the organization, and several "pathologies" found in matrix organizations will be presented. The final portion of the matrix section will review articles dealing with research conducted on matrix organizations. The literature on self-managed teams will provide several concepts and factors involved in the effective operation of teams in an organization.

The final section of the literature review will present a set of assumptions, based on the information contained in the literature review, that the researcher would expect to observe in the data collect at NAWC-ADI.

A. ORGANIZATIONAL SYSTEMS MODEL

To understand an organization's ability to change, one must first develop a concept of what an organization is. Beer (1988) states that the critical dimensions of organizational change consists of the amount of dissatisfaction within an organization, the model of the organization, and the process for changing the organization. The effects of the change process are determined by the interaction between these dimensions. (The value of a change must compare the ultimate effects of change with the cost of change). The definition of an organizational model is central to the change process. Without a model, any attempt at analysis is limited by the experience of the manager. The manager's solution may be to solve new problems with solutions that have worked in the

past, instead of analyzing all of the appropriate dimensions.

Beer states,

Too often change efforts to improve the organization specify only one or two of these dimensions, usually strategy and structure, ignoring the behaviors, attitudes and competencies required for the new organization to work. (p. 3)

Authors of organizational systems models agree that organizations are composed of separate components that interact with their environment and among themselves. In discussing organizational models, Lippitt, Langseth, and Mossop (1985) present a "Seven-Box Diagnostic Model for Analyzing an Organization's Needs." The components of the model are as follows; organizational context, outputs (organizational, group and individual), organizational culture, task requirements, formal organization, people, and physical setting and technology. This model allows for interaction between all of the components listed above and provides the researcher with a systematic approach to analyze an organization.

Nadler and Tushman (1991) acknowledge the importance of open-systems theory in making the manager aware of basic organizational models. However, they state:

While systems concepts are useful as an overall perspective, they do not help the manager systematically diagnose specific situations or help him/her apply research results to specific problems. A more concrete model must be developed that takes into account system-theory concepts and processes and helps the manager deal with organizational reality. (p. 548)

Nadler and Tushman's model consists of inputs, transformation processes and outputs. Organizational inputs pertain to environmental inputs, resources, and strategy. The transformation processes involve task components, individual components, organizational arrangements, and the informal organization. The nature of outputs contained in this model include individual behavior and effect, group and intergroup behavior, and system-functioning (how well the system is attaining its goals, utilizing its resources, and adapting).

However, the researcher or manager must not settle for a simple listing of the components contained in a model, but must understand the dynamic relationships between the model's components. The importance of Nadler and Tushman's model lies not in the specific listing of the components, but their concentration on the idea of "congruence."

The model focuses on the critical system characteristic of dependence. Organizations are made up of components or parts that interact with each other. These components exist in states of relative balance, consistency, or "fit" with each other. The different parts of the organization can fit well together and thus function effectively; or fit poorly, leading to problems. Given the central nature of fit in the model, we shall talk about it as a congruence model of organizational behavior, since effectiveness is a function of the congruence of the various components. (p. 548)

This concept of congruence is central to analyzing an organization's effectiveness. The idea of fit is of particular interest to the manager in regard to the transformation processes since this is where he/she operates. Nadler and Tushman present a "Congruence Hypothesis."

Other things being equal, the greater the total degree of congruence of fit between the various components, the more effective will be organizational behavior at multiple levels. Effective organizational behavior is defined as behavior which leads to higher levels of goal attainment, utilization of resources, and adaptation. (p. 554)

This implies that if researchers want to understand what is occurring within an organization they must identify the inconsistent fits among the components. In addressing this issue of congruence, the manager must consider how effective their solution will be in correcting problems of fit between components instead of trying to solve a particular problem.

Tichy (1983) identifies similar components in his organizational model. These components or change levers are external interface, mission, strategy, managing organizational mission/strategy processes, task, prescribed networks, organizational processes (communication, problem solving, and decision making), people, and emergent networks.

Tichy's organizational systems model accounts for three additional organizational dynamics; the technical, political, and cultural views. These aspects present different problems for the organization. Tichy summarizes the design problems as follows:

- **The Technical Design Problem:** Organizations face a production problem. Social and technical resources must be arranged to produce desired output.
- **The Political Allocation Problem:** Organizations face an allocation of power and resource problem. The uses to which the organization is put as well as who reaps the benefits.

- **The Cultural/Ideological Mix Problem:** Organizations are held together by a normative glue-- shared beliefs. Organizations must determine what values need to be held by what people. (p. 8)

Tichy refers to the combination of these three aspects as a "strategic rope." He states that it is difficult to determine the differences between the three from casual observation. However, he sees the role of the manager as preventing the unravelling of this strategic rope.

Because of the dynamic nature of organizations, differences exist in the amount of attention and effort given to any one aspect of the organization. This shifting focus results in cyclical manifestations for the technical, political, and cultural aspects of an organization. The role of the manager is to make changes in the organization's components (mission, task, people, etc.) to affect these three systems.

The strategic change management task is to keep the organization internally aligned and aligned with its external environment.Regardless of whether or not it is explicitly and consciously aligned, organizations are proposed to be effective to the extent that there is alignment within each system - technical, political, and cultural - and across the three systems. (Tichy, 1983 pp. 117-118)

The matrix of components (change levers) and the management areas (technical, political, and cultural) present the manager with the ongoing task of seeking to align all aspects of the organization to reduce the levels of uncertainty within and between each system. As a result of its cyclic nature, uncertainty in the systems will occur at different times. A

response is triggered to address the specific problem. According to Tichy, this response will affect all three systems and must be considered in light of its effect on strategic alignment.

Systems models provide the researcher with a much broader view of organizations than previous classical bureaucratic models or the human relations models. In addition to identifying diverse components within an organization, systems models highlight the importance of congruence or strategic alignment between the components.

B. MATRIX ORGANIZATIONS

A major component of organizational systems is the coordinating mechanism that provides the framework for organizational activity. Mintzberg (1983) concluded that mechanisms and parameters fall into "natural clusters, or configurations."

Now we take up the configuration hypothesis, which postulates that effective organizations achieve an internal consistency among their design parameters as well as compatibility with their situational factors -in effect, configuration. (p. 152)

Mintzberg identifies five separate configurations of structure and situation: Simple Structure, Machine Bureaucracy, Professional Bureaucracy, Divisionalized Form, and Adhocracy. He states that organizations do not merely react to situational factors, but must be seen from the systems

approach as being "gestalts" that interact among themselves and with their environment.

Organizations that are complex and dynamic and seek to capitalize on innovation and creativity represent an Adhocracy configuration.

In Adhocracy, we have a ... highly organic structure, with little formalization of behavior; high horizontal job specialization based on formal training; a tendency to group the specialists in functional units for housekeeping purposes but to deploy them in small, market-based project teams to do their work; a reliance on the liaison devices to encourage mutual adjustment, the key coordination mechanism, within and between these teams; and selective decentralization to and within these teams, which are located at various places in the organization and involve various mixtures of line managers and staff and operating experts. (p. 254)

The Adhocracy tends to ignore the traditional unity of command aspect of organizations and group activities into matrix structures. Concentrating on its client's problems, operating and administrative requirements are "blended into a single effort." In this configuration functional, project and integrating managers serve as liaison devices between groups.

Strategic issues are addressed lower in this configuration than others. As such, top managers are occupied with monitoring projects, acting as a liaison with the external environment, and dealing with the problems that might surface as a result of the fluid nature of Adhocracies. The conditions of an Adhocracy is that it is dynamic and complex. This complexity encourages the organization to develop

"differentiated work constellations" to address the different and frequent product changes faced by the organization.

Mintzberg notes three issues that are associated with Adhocracy. First, people may have negative reactions to the ambiguity and conflict found in the Adhocracy. While it does provide for greater "democracy with less bureaucracy," the dynamic nature of a ever-changing organization does take its toll on personnel.

Second, inefficiencies may develop in the Adhocracy. If used to accomplish "ordinary things," it will not be as efficient as other configurations. The Adhocracy is designed to address complex and dynamic issues. This requires greater communication and this has a time and financial cost associated with it. Additionally, unbalanced workloads may exist between the periods when one project is ending and before another project starts. This temporary excess capacity can result in a drain on cash reserves.

Third, faced with the conflict, ambiguity, and perceived inefficiencies, some organizations may try to transition to a more bureaucratic configuration. This reversion to more traditional forms will not lead to increased effectiveness if the goal of standard policies and operating procedures is achieved at the cost of aligning the organization's configuration with its internal and external environment.

Bartlett and Ghoshal (1992) have stated that the problems faced by a matrix organization are not one of goals, but one of process:

The problem was that they defined their organizational objectives in purely structural terms. Yet the term formal structure describes only the organization's basic anatomy. Companies must also concern themselves with organizational physiology - the systems and relationships that allow the lifeblood of information to flow through the organization. They also need to develop a healthy organizational psychology - the shared norms, values, and beliefs that shape the way individual managers think and act. (p. 372)

Bartlett and Ghoshal state that an organization's corporate vision must be clearly communicated, personnel must identify with the corporate goals resulting from the vision, and personnel must be developed to integrate their thinking and activities into the larger corporate agenda. The goal is expressed by a senior executive they interviewed: "The challenge is not so much to build a matrix structure as it is to create a matrix in the minds of our managers." (p. 380)

Davis and Lawrence (1977) have provided an extensive overview of matrix organizations. They define matrix organizations as:

any organization that employs a multiple command system that includes not only a multiple command structure but also related support mechanisms and an associated organizational culture and behavior pattern. (p. 3)

Davis and Lawrence state that a matrix structure is preferred when three basic conditions exist simultaneously. As outside pressures develop for dual focus on such issues as function, product, or location, a dual command structure is needed to

provide for a balance of power between the different focus areas. The pressure for high information-processing capacity is also a condition of matrix development. As uncertainty in the external environment, complexity of organizational tasks, and the interdependency among organizational groups increase the need for high information-processing capacity increases. The third basic condition for matrix adoption is increased pressure for shared resources. Pressures of economies of scale require a system to maximize scarce resources. The matrix organization provides flexibility by allowing personnel and machinery to be shifted from project to project to meet organizational demands.

For Davis and Lawrence a matrix organization is more than structure, they include "Matrix Structure + Matrix Systems + Matrix Cultural + Matrix Behavior." All four components are required to adequately address the basic conditions listed above by:

(1) the focusing of undivided human effort on two (or more) essential organizational tasks simultaneously, (2) the human processing of a great deal of information and the commitment of the organization to a balanced reasoned response (a general management response), and (3) the rapid redeployment of human resources to various projects, products, services, clients, or markets. (p. 21)

This can only be accomplished if all aspects have been assimilated into the total matrix organization.

Mature matrix processes involve power shifts from old hierarchical structures to dual command structures, location shifts from functional to project arrangements, and a focus on

product innovation. Flexibility is the key characteristic of matrix organizations. They capitalize on the economies of scale provided by larger organizations, while utilizing the creativity of smaller project teams. As the organization learns to combine, focus, and refocus all aspects of the organization, resistance to change is decreased.

The role of management within the matrix organization is different than other organizational configurations. The top leadership role is to balance power within the dual command structure, manage the decision making context, and to set the standards of acceptable performance and behavior. The matrix area bosses (functional and project) must develop new managerial perspectives. Recognizing that they have lost some control over production units, functional managers focus on establishing communication channels with the project managers to become more customer-oriented. The project manager assumes a general executive approach to management. They must integrate all functional members into one team in the interest of the project. This integration is accomplished through influencing, persuasion, and communicating instead of direct authority since authority is shared with the functional manager. The most challenging position is that of the 2-boss manager. Given that they are held accountable by the functional manager and the project manager, the potential for conflict is high. However, by assuming a general management perspective the 2-boss manager is capable of influencing the

organization to a much greater extent than in the hierarchical organization, they have two organizational avenues instead of one.

Matrix organizations place greater demands on individuals than other configurations. The success of a matrix will relate directly to how well the organization helps its personnel function in the new system. Because of increased interaction and communication, diversity within the organization will surface more often. This diversity will lead to conflicts between individuals and it must be confronted. The conflict is not a problem; it is the manner in which it is dealt with. Conflict management skills are essential for matrix organization.

The assumption in a matrix is that this conflict can be healthy and that higher quality solutions will develop if people with different expertise and orientations relating to a given task get together and thrash out their differences. (Davis and Lawrence, p. 104)

Individuals are required to collaborate more frequently in a matrix. For effective collaboration to occur, trust must be developed throughout the organization (horizontally and vertically). Open relationships built on trust must be actively developed. Individuals throughout the organization have to be capable of utilizing sophisticated problem solving skills. Normally only required of top managers, matrix organizations mandate that the lowest levels make corporate decisions. Lower level managers are faced with analyzing qualitative and quantitative corporate information, and

weighing short and long range considerations in an environment full of uncertainty.

Not all individuals may be capable of adjusting to matrix organizations. The organization has the responsibility to develop its personnel.

It is not sufficient to merely tell people that they will be shifting from being a conventional line manager to a manager in a matrix. If they are to be effective, they must quickly build effective working relationships with the others in the matrix. It is too risky to let chance events in their contact form the character and process of the group. (Davis and Lawrence, p. 109)

Davis and Lawrence feel that team building will assist the team in understanding the common expectations of all members. Such issues as group objectives, meeting times, roles and responsibilities of members, leadership roles, decision making procedures, conflict resolution, and interactions with functional areas should be clarified at the outset of team development. Individually, managers need to receive training in management philosophy, matrix organizations, effective communication, group processes, and new business skills (corporate processes such as project funding and budgeting). Simulations and monitored teambuilding will augment the learning process. The organization reinforces the matrix concept through its selection criteria, performance appraisals, and career development. A matrix is a stressful environment, but with individual and group training (plus organizational reinforcement) individuals obtain greater levels of freedom and power. This new freedom can lead to

heightened levels of commitment and motivation that results in higher individual productivity and greater organizational effectiveness.

Davis and Lawrence have identified several common pathologies in matrix organizations. "Power Struggles" are more common, because shared power is inherent in matrices. The role of balanced power is essential to prevent power struggles.

If processes are not controlled or informal processes are allowed to coordinate critical tasks, "Anarchy" may result. This comes from a lack of appreciation that a matrix is a "definite structure and not a 'free form' organization." (Davis, p. 133) Critical tasks require explicit arrangements.

"Groupitis" can develop if the idea of matrix is understood to mean that all project decisions must be made by a unanimous vote during group meetings. To prevent this, groups must be trained in the characteristics of matrix organizations and develop ground rules during the teambuilding stage regarding decision processes.

"Collapse during economic crunch" also occurs to matrix organizations. The only preventive measure for this is management commitment. If the organization is not going to be committed, it is much better not to engage in matrix operations. Once management retreats from their commitment, it will not be able to return to a matrix system because trust in management is essential in matrix organizations.

"Excess overhead" has been found in the early stages of matrix development; however these costs disappear as the matrix matures. Management does contribute to this problem by filling every position with full-time employees. Assigning managers to multiple roles can reduce overhead cost.

"Decision strangulation" may occur in matrix organizations due to constantly clearing decisions through the functional areas, escalating all conflicts to higher levels, and reliance on unilateral decision style by one manager. To prevent clearing decisions, team members must be empowered by the functional areas to make decisions, otherwise there is no need for a matrix system. Managers must reinforce the necessity of conflict management at the lower levels by requiring individuals to solve any problem that belongs in their sphere of responsibility. To prevent unilateral decision making from interfering with the decision process, the organization must ensure that managers understand that bilateral decision making is the accepted practice. Anyone who is operating in a unilateral style, "must rework their concept of decision making or look for employment in a non-matrix organization." (Davis, p. 140)

"Sinking" reflects an organization that has trouble maintaining the matrix at higher levels, but has been incorporated at the lower levels. This will result in confusion, miscommunication, and frustration. To prevent

this, a complete conceptualization of the matrix organization must be developed and implemented.

"Layering" is when the matrix fever begins to take over all aspects of an organization regardless of effectiveness. Matrices within matrices can become more of a burden than the problem they were designed to correct. Again, an adequate conceptualization will prevent this from occurring. "Navel gazing" refers to an organization who has lost touch with the outside world (or customer), because of focusing solely on its internal disputes. Generally, this is the result of having to address other pathologies. By preventing those other problems from occurring, less attention will be focused internally.

Mintzberg, Bartlett and Ghoshal, and Davis and Lawrence have provided a conceptual overview of matrix organizations. The remaining portion of this section will address research articles regarding matrix organizations and project groups working in research and development arenas.

Burns and Wholey (1993) addressed the reasons that organizations adopt and abandon matrix management programs. They examined 1,375 hospitals that had been involved in matrix programs. They found that for those hospitals adopting a matrix program, external factors (such as the prestige of the organization within its professional network, regional pressure by hospitals that had already adopted matrix programs, and the degree of status conferred on the organization by its professional network) played a significant

role in the organizations studied. In addition to influencing technological innovation, external organizational networks influenced administrative innovation. This relates to the status and prestige that can result from implementing a program that is favored by the professional circle of the organization. Internal factors are dominant in deciding to abandon a matrix program. Financial problems, staffing problems (such as turnover and development), and political opposition were the leading dynamics involved in the abandonment of matrix programs. A special note was provided by Burns and Wholey in regard to political opposition by the lower-level managers. Plant managers and first line supervisors may view the transfer of power to project teams as a loss of power. They may resent having to work with team members in "collegial, consultative relationships."

Joyce (1986), conducting a social experiment in the effects of matrix structure, determined communication processes, role perceptions, and work attitudes were affected by the introduction of a matrix structure into an engineering division of an aircraft manufacturing firm. Three groups within the engineering division were studied; engineering (33 participants), drafting (21 participants), and a control group (25 participants). The key variable explaining the degree of variance in communication, roles and attitudes was the amount of change implemented by the matrix. For example, the less familiar the division was with team assignments, the greater

the physical relocation, and the more abrupt the introduction, the greater the negative impact on the organization. In regard to communication, frequency did increase, but quality (as it pertains to participative and directive behavior of participants toward problem solving) was rated as lower by one of the two divisions studied:

Although the reorganization brought predicted improvements in the quantity of communications in one experimental group, the change unfavorably affected the quality of communications, and corresponding decreases in coordination occurred. This suggests that implementing a matrix structure must favorably affect both quantity and quality of communications for it to result in such desirable outcomes as improved coordination. (Joyce, p. 552)

After six months, role ambiguity, job involvement, satisfaction with; work, supervision, co-workers, pay and promotions all showed slight decreases for one group (engineers) and sharp decreases for the group (drafters) which experienced greater upheaval in the implementation.

Addressing the balance of power in matrix organizations, Katz and Allen (1985) determined that a clear distinction was needed between the project and functional manager. Deriving their data from the study of nine R&D organizations (public and private) they determined that instead of attempting to equalize the power of each manager, the differences in their positions required them to have different spheres of influence. The only joint aspects of their influence should be in the areas of salaries and promotions. The project manager must be concerned with the outside pressures of the

customer and the coordination of the different functional representatives on the project. The functional manager has to concentrate on the technical aspects of his/her specific area to ensure that excellence and state of the art technology supports the project.

The findings imply that it is not through mutual balance or joint responsibilities along single dimensions of influence that the matrix should be made to work, but rather that the matrix should be designed and organized around more explicit role differentiation among dimensions of influence. (Katz and Allen, p. 84)

Barker, Tjosvold, and Andrews (1988) investigated the role of conflict management on matrix organizations among 315 engineers and technologists in a western Canada utility firm. They determined that those managers who were co-operative and confirming of conflict were more successful in handling conflict than those who tried to compete with it or avoid it.

These damaging effects of conflict are much more likely to occur when a project manager attempts to win conflicts when that is possible (competitive mode). Conversely, the constructive effects of conflict are much more apt to occur when a project manager confirms the competence of the team members (confirming mode) and establishes a win - win atmosphere where people argue freely about the best ways to attain the essential goals of all persons involved (co-operative mode). (p. 176)

Barker and Tjosvold suggest that it is not essential for every project manager to have the qualities described above, but they must ensure that someone on the team does have these qualities and is given the leeway to manage team conflict.

In studying 32 project groups in a R&D division of a major corporation, Keller (1986) determined that group cohesiveness was the best predictor of project team performance.

The findings suggest that cohesive project groups were able to achieve high project quality and meet their goals on budgets and schedules. (p. 723)

Innovative orientation, as determined by an adaption-innovation inventory to measure "ability to do things differently," was also an important predictor of project quality, but did not appear to be important for budgeting and scheduling performance. The importance of group cohesiveness suggests that team development, physical location, supportive leadership, and stable group memberships should be facilitated by the organization to increase project performance.

C. SELF-MANAGED WORK TEAMS

This section presents a discussion of the benefits and characteristics of self-managed teams. It describes organizational conditions which affect group effectiveness and review the importance of group cohesiveness, size and communication within groups. A brief discussion of inter-group dynamics is also provided. Finally, this section addresses the impediments to group effectiveness and the limitations of self-managed teams.

Self-managed work teams are specialized work teams. Self-managed teams often arrange schedules, hire and fire team members, manage budgets, and deal with customers. Since the

basic premise is to have the team manage itself, the requirement for lower and middle management decreases. In today's environment of downsizing and streamlining, creating self-managed teams may reduce labor cost and increase efficiency.

Self-managed teams are capable of addressing more complicated projects than the traditional functional approach, because of the combination of multi-functional experts into one team. Since team members are better able to see the results of their efforts from start to finish, they are able to take on more responsibility for the success of the project. This can have the additional benefit of creating a more motivated team. Aside from the multi-functional expertise that teams have, a synergistic benefit can result. Team members are in a better position to cross-train for additional technical skills, they can develop an awareness of interpersonal group dynamics, and can begin to develop new perceptions about a project that would not have developed in their old functional paradigm.

Hackman (1990) presented three characteristics to better define work groups. These concepts included a definition of work groups; a definition of group effectiveness; and a orienting conceptual framework. According to Hackman, work groups have the following characteristics:

- They are intact social systems, complete with boundaries, interdependence among members, and differentiated member roles.

- They have one or more tasks to perform. The group produces some outcome for which members have collective responsibility and whose acceptability is potentially assessable.
- They operate in an organizational context. This means that the group, as a collective, manages relations with other individuals or groups in the larger social system in which the group operates. (Hackman, 1990, p. 4)

Hackman contends that group effectiveness is a three-dimensional conception that will vary according to the significance of different circumstances. These dimensions are:

- The degree to which the group's productive output meets the standards of quantity, quality, and timeliness of the people who receive, review, and/or use that output.
- The degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future.
- The degree to which the group experience contributes to the growth and personal well-being of team members. (Hackman, 1990, pp. 5-7)

The orienting framework for studying or managing teams is best thought of in terms of "the creation of conditions that support effective team performance." (Hackman, 1990, p. 9)

The process criteria of effectiveness includes (1) ample effort, (2) sufficient knowledge and skill, and (3) task-appropriate performance strategies. Organizational conditions affect the group's ability to perform effectively: group structure (including task structure, group composition, and core norms); supports and reinforcement (including reward systems, educational systems, and information systems); and expert coaching and process assistance to maximize effort and

commitment, knowledge and skill, and creative performance strategies. (Hackman, 1990, pp. 7-14)

Hackman (1990, pp. 479-493) discusses four additional themes that applied to work groups. The time constraints and rhythm of the groups are important. As deadlines and time requirements are made clearer, groups become more effective. Effective groups develop a rhythm to their work activities. The second theme is a "self-fueling spiral." This is simply a version of the self-fulfilling prophecy. This is where a team or individual is labeled as ineffective, treated as such, and soon begins to perform in an ineffective manner. The reverse would be true for an effective team. Authority is also seen as an important characteristic of group effectiveness. The amount and stability of a group's authority, and the timing and focus of external authority interventions affect group effectiveness. The work content or "stuff" (Hackman, 1990, p. 487) that the group is engaged with shape group dynamics. The differences between production teams and management teams effectiveness may have as much to do with the type of information or "stuff" that they deal with, than with the differences in personnel or backgrounds. A group, over time, will begin to align with their "stuff". This group alignment can lead to greater group cohesion or to group tunnel vision about their role in the organization.

The specificity of group goals and accuracy of performance feedback have been found to increase work group cohesiveness.

(Koch, 1979) Cohesiveness, in turn, has been positively linked to performance in self-managed work teams. (O'Keefe, Kernaghan, and Rubenstein, 1975) Cohesiveness based on team members' attraction to the task may improve their commitment to group goals, their ability to coordinate through common understanding, and their level of participation in group process. This improved level of commitment to group goal accomplishment should lead to increased effectiveness. (Goodman, Ravelin, and Schminke, 1978) Group size can affect the effectiveness of group projects. O'Reilly and Roberts (1977) examined 43 small to medium-sized groups (3-53 members) in three naval aviation units. While an optimal size group was not given, they determined that:

As group size increased, the possibility for group connectedness decreased because of limitations on the amount of effort that an individual can spend interacting with an increasing number of others. (p. 677)

Another important finding was that information accuracy and communication openness were strongly related to group effectiveness.

A variation of self-managed teams is a multi-disciplinary (cross-functional) project team similar to project teams at NAWC-ADI. These multi-disciplinary teams address the issue of "organized complexity." Projects that cannot be solved by a single discipline or functional area can be undertaken by a team of experts representing a multitude of functional areas.

Multi-disciplinary team structure is based on dual assignments of organizational members to both functional

areas [competency centers at NAWC-ADI] and project teams. Individuals may be involved in one or more project teams at a time, while continuing to report to their discipline section [competency center]. As a result, members operating in this design system may have multiple reporting relationships. (Uhl-Bien and Graen, 1991, pp. 3-4)

Since team members are not technical experts in all areas of a project, it is important that they collaborate with each other to integrate all discipline areas required for a specific project. (Uhl-Bien and Graen, 1991)

The success of self-managed teams can not be determined solely by their intra-team aspects. Ancona and Caldwell (1990) have done extensive research in the area of "boundary management," the process by which teams manage their interactions with other parts of the organization. This process deals not only with communication or interactions that the team initiates but also to how the team responds to input from others. They separate team members' behavior into four distinct patterns of activity:

- AMBASSADOR - activities directed at representing the team to others and protecting the team from interference. Usually aimed at the upper levels of the organization.
- TASK COORDINATOR - activities aimed at coordinating the team's efforts with others. People taking on these activities communicate laterally rather than up the organization. (Also called SENTRY in further studies).
- SCOUT - activities aimed at obtaining information for the group. These are most important in the early stages of the group's formation.
- GUARD - activities aimed at keeping information and resources inside the group.

It was discovered that high-performing product development teams generally carry out more external activity than low-performing teams. More specifically:

...high levels of Scout activity are only important early in the process, while ambassador and task coordinator activity remain linked to performance throughout the product development cycle. Members of high performing teams did not simply react to communications from others; they were more likely to be the initiators of communication with outsiders than those individuals on low-performing teams. (Ancona and Caldwell, 1990)

Ancona (1990) described three types of external group interactions. These are informing, parading, and probing interactions.

...Probing teams, manipulate the environment; they leap before they look, perform trials to learn what an error is, and discover what is feasible by testing presumed constraints. This approach allows for accommodation to a complex, changing environment. In contrast, like parading teams, are more passive; they accept the information that their environment provides, thus limiting their perspective. Informing teams are even more isolated. (p. 357)

Probing teams have the advantage of identifying and understanding external demands, while promoting themselves in a positive manner to outside individuals and teams. As teams become more isolated from their external environment, they increase their probability for failure.

Sundstrom, De Meuse, and Futrell (1990) identify organizational integration as important for group effectiveness.

When a team's mission requires a high degree of external integration or linkage, effectiveness depends on the pace and timing of exchanges with other work units, as in a production team that gets materials from the preceding

team and provides the next operation with materials for its work. (p. 124)

For groups which do not require significant levels of synchronization with external groups, internal group dynamics were a more important measure of effectiveness.

Hackman (1990) identified five common mistakes (Trip Wires) that impede group effectiveness.

- Call the performing unit a team but really manage members as individuals.
- Fall off the authority balance beam.
- Assemble a large group of people, tell them in general terms what needs to be accomplished, and let them "work out the details."
- Specify challenging team objectives, but skimp on organizational supports.
- Assume that members already have all the competence they need to work well as a team. (pp. 493-504)

Hackman amplifies his concern for balancing authority in works groups by expressing the necessity for managers to retain control for the direction and constraints on teams, while assigning full authority to the team for the "means by which it accomplishes its work." (Hackman, 1990, p. 496)

Teams should not be left to "work out the details." Instead, effective teams consist of three components.

First is a well designed team task that engages and sustains member motivation. ...Second is a well composed group-one that is as small as possible, that has clear boundaries, that includes members with adequate task and interpersonal skills, and that has a good mix of members-people who are neither so similar to one another that they are like peas in a pod nor so different that they have trouble working together. ...Third is clear and explicit

specification of the extent and limits of the team's authority and accountability. (Hackman, 1990, p. 499)

The most effective teams require organizational support. Supports include a reward system for teams (not individuals), educational systems (including professional and interpersonal training), an information system to collect and act on data essential to task assignment, and material resources (equipment, tools, space, etc.).

Team development does not happen by magic. A coaching or leadership role is normally required for teams to develop into effective units. A leader needs to be aware of the time and focus of his interventions into the group to minimize the disruptive factors of the intervention. A leader or manager needs to understand that the initial development of a work group is the most critical. It is important that the support and assistance be directed up front if the group is to be effective.

The role of a team leader or manager, then, involves three kinds of activities: (1) creating favorable performance conditions for the team, either on one's own authority or by exercising influence upward or laterally with managerial colleagues, (2) building and maintaining the team as a performing unit, and (3) coaching and helping the team in real time. (Hackman, 1990, pp. 501-503)

There are limitations to self-managed and multi-functional teams. Costs will go down from improved quality and the reduction in supervision required, but additional human resource costs will appear, primarily in the area of the additional training that will be required. Team members need

the skills necessary to be cross-functional and flexible within their own team. Training in group processes and effective teamwork is vital to the success of self-managed teams. Group process training is expensive and time-consuming. If a skill-based pay system is used, salary expenses go up resulting from increased training provided.

Other limitations include:

- If an organization is composed of teams and non-team units, conflict between the two different structures may occur.
- Meetings become lengthy and time-consuming, therefore slowing down the decision making process.
- Individual expectations of team members for a perfect setting may be too high and could result in personal frustration.
- Teamwork is demanding on individuals as cooperation is needed between team members. Personal ideas and philosophies must be in sync or put aside for teams to function (Lawler, pp. 111-113).

With these limitations in mind, managers must decide whether or not to use self-managed teams, and determine the degree to which the teams should be self-managed.

D. HYPOTHESES

While we are not hypothesis testing, based on the literature about matrix organizations and self-managed teams we might expect to observe several tentative hypotheses concerning NAWC-ADI. Having transformed from a traditional bureaucratic organization to one that has implemented a matrix

structure and self-managed teams, these hypotheses are presented:

1. Inconsistent fit between the matrix structure and other organizational components.
2. People having negative reactions to ambiguity and conflict associated with the reorganization.
3. Frustration over the use of the matrix structure, if used for routine processes.
4. Increased levels of organizational conflict.
5. Increased teambuilding and group dynamics training.
6. Organizational efforts to reinforce the new organization through personnel management efforts (selection, appraisals, and development).
7. Certain types of pathologies, as identified by Davis and Lawrence (power struggles, anarchy, groupitis, excess overhead, decision strangulation, sinking, layering, or navel gazing).
8. Communication frequency increases, but some questions as to the improvement in quality of communication (as related to participation and direction).
9. The amount of conflict between the project and functional managers relating to the degree of distinction between their spheres of influence (balance of power).
10. More positive attitudes within groups that are co-operative and acknowledge the existence of conflict.
11. Group cohesiveness identified as the strongest characteristic within teams that are working well together.
12. Certain "Trip Wires," as identified by Hackman (1990) (managing members as individuals, falling off the authority balance beam, letting the group "work out the details," skimping on organizational supports, and making false assumptions concerning team member's group skills)

IV. METHOD

A. DATA COLLECTION

The interview technique was determined to provide the best potential for gleaning qualitative data. Using techniques described by Downs (1988) as a starting point, the research team developed an interview protocol (see Appendix D). The interview protocol provided an introductory statement and laid out general questions in the following areas:

- How well the organization was operating.
- How well communication and decision making processes were working.
- Perceptions regarding how well other organizational members understood decision making priorities, policies, and strategies since the reorganization.
- Specific probing questions pertaining to organizational horizons, learning mechanisms, and communication flow.

The interview protocol was intentionally designed to provide the interviewer with freedom to pursue emergent topics as identified by the person being interviewed. Additionally, the protocol was evaluated by the interview team each evening during the actual interview phase to adjust for topic discoveries. Each interview lasted approximately one hour and was conducted by one of four interviewers over a four-day period.

A total of 55 interviews were conducted during the week of April 19, 1993. The majority of these interviews were done on a one-to-one basis (with the exception of two group interviews of four personnel and two group interviews of two personnel). The interview team defined a stratified sample of top and low performing teams. The specific individuals were then identified by NAWC-ADI. The interview team monitored the positions of the personnel being interviewed to ensure that there was a representative sample of organizational levels and work groups. A listing of interviews conducted by level and work group is contained in Table 4-1. Each interview was recorded and later transcribed to facilitate data analysis.

TABLE 4-1

INTERVIEWS CONDUCTED AT NAWC-ADI
(BY LEVEL AND WORK GROUP)

	LEVEL ONE	LEVEL TWO	LEVEL THREE	TOTAL
ALPHA	9	6	1	16
BETA	7	2	1	10
GAMMA	5	2	1	8
PROJECT OFFICE	7	4	0	11
COMMAND STAFF	6	1	3	10
TOTAL	34	15	6	55

B. DATA ANALYSIS

The interviews were analyzed using qualitative methods described by Glaser (1978) and Whyte and Hamilton (1965). Two differences were noted between the methods and examples listed above and this study. As commissioned by NAWC-ADI, the initial research topic of communications was the focus of this study. This directed the initial data collection and did have a bearing on the research design. However, Glaser's ideas on coding (discovery of underlying indicators in the data), constant comparison (ongoing analysis), memoing (idea papers), and identification of basic social processes instead of factual or quantitative data were beneficial in analyzing the interviews. A brief explanation of constant comparison and memoing are described below. The difference between Whyte's and Hamilton's study and this research project was that no work or process observations were made by the interview team at NAWC-ADI. The interviews provided the bulk of information analyzed for this study.

The first step in the analysis was to read each interview to determine the major issues identified by the interviewees. As the interviews were read, topic areas began to develop. The commonality of the data facilitated the identification of the following topic areas; personnel management, team building, roles and responsibilities, processes, communication, and conflict. Throughout the analysis process, the principle method of determining topics was a constant

comparative process. This process requires the continuous comparison of quotes to quotes, quotes to ideas, ideas to ideas and all data with emerging topics. This process allows topics to grow out of the data. Instead of establishing a topic framework at the beginning of the analysis, the constant comparative process allows topics to be generated from the data that provides a greater degree of fit between the data and the topics.

After reading the interviews and identifying the key portions, the interviews were re-read for better clarity and understanding. The central ideas were then highlighted for later reference. The key highlighted excerpts that reflected the main issues of each interview were then coded by topic(s), organizational level, work group, assigned project, and interview number. Next, the coded data were transferred to a separate data file. The Wordperfect (ver.5.1) word processing software program was used to store the data. The program allowed the data to be sorted by any combination of the codes listed above (see Appendix E for sorting procedures).

The first sorting (for each level) was by topic and work group. The sorted data were reviewed to determine if the information reflected a common topic. If it did not, the data were re-coded to the appropriate topic or a new topic title was created. The review allowed for the development of sub-topics within each topic area. For example, the topic of personnel management was further broken down into sub-topics

for promotions/advancements, performance evaluations, and administrative procedures. A descriptive summary was written for each level and work group (level three was described as one group, because of the small number of level three interviews). The descriptive summaries were then analyzed for similarities within and between the work groups and levels. A second sorting was done by topic to compare with the previous summaries. These two sources were then analyzed with the information contained in the literature review.

The constant comparative process described above required that idea papers or memos be written to provide a basis for analyzing the interviews. "Memos are the theorizing write-up of ideas about codes and their relationships as they strike the analyst while coding" (Glaser, p. 83) Memos were used to help the analyst gather his thoughts as the comparative process continued. A memo was developed after the analyst conducted his interviews, and a joint memo or flow diagram of independent and dependent variables was developed by all interviewers to represent the common topics identified during the interviews. The analyst also used the memoing process after each descriptive summary and as part of the final phase to consolidate the topics and themes into one set of themes. The central themes and processes identified during this analysis are contained in Chapter V.

V. ANALYSIS

A. INTRODUCTION

The qualitative data analysis revealed several themes that exemplify NAWC's reorganization. The themes are broadly broken into two categories: (1) the positive effect of the NAWC reorganization; and, (2) the challenges still facing NAWC. The quotes included in this section are acknowledged by interview numbers to ensure the anonymity of the personnel interviewed.

B. POSITIVE EFFECTS OF THE NAWC REORGANIZATION

1. Many people, particularly those within the project teams, feel that they are working together well and implementing solutions.

During NAWC-ADI's reorganization, the responsibility for design, development, and manufacturing of aviation components was taken away from specific functional areas and given to multi-disciplinary project teams. These teams are created to control all of the requirements of a particular project (ex., global positioning team, or the F-18 team). Team members are pulled from various specialty areas (or competency centers) so that the project team has the personnel resources to adequately develop a strategy and work plan for a project without having to go through a bureaucratic maze of

functional areas (as with the old management system at NAWC-ADI).

While realizing that teams may not be able to address all issues, team management was seen to allow for the expression of alternatives that would not have been surfaced in the past. Within project teams, team members are better able to take ownership for an entire project instead of just one functional area. By looking at a problem from a project perspective, team members are willing to address issues and develop solutions that may have been outside of their purview in the past. Decisions about manufacturing are being made during the design phase, and cost analysis is being considered throughout the project cycle. A project leader (PL) for the SMQ11 project was impressed with his team's ability to find solutions to costing problems that would have been the responsibility of some branch manager or supervisor in the old organization.

We were working on a cost situation on converters, when I communicated the fact back to the team that we had to watch out for the dollars. We were running short on funds. These guys went out, took a look at the cost, the hours that somebody had estimated years ago to build these things and said, "my gosh, they've got all these hours to do this. It doesn't take that long and they don't have any hours over here and this is where the time takes." And, they actually work those issues out themselves. (#23)

In addition to allowing for alternative ideas, teams were seen to provide a sense of a common goal and vision for projects. This common goal served to unite the team members and was seen as a cohesive force in the team. Team members

were better able to visualize the total requirements of the projects and work toward that common goal instead of being concerned with the affect of their decisions on their competency center.

We have common goals and visions and that is to get these particular systems built and delivered, without running in the hole - money wise, and to make the customer be satisfied with that. And, when you share those common goals, then the team seems to pull together and work together toward those ends. (#23)

In those teams that had a common vision and were experiencing improved problem-solving participation, teambuilding was seen as the responsibility of all the members of the project. No longer able to be concerned with only a sub-component of a total project, team members are required to work together on a more personal basis with their peers. Functional walls between design, development, and manufacturing were no longer in place to insulate one specialist from another. To better communicate within the teams, members were developing the skills to address intra-team dynamics.

Some engineers need to sharpen their people skills. They have a tendency to turn people off, and the rest of the team, as a matter of fact. Its interesting to watch how the team tries to compensate for somebody like that. As, PL, at first, I was frustrated about, you know, I had to solve this problem and smooth the water and the whole bit. But, I found that other members of my team were able to deal with these people from time to time. So, I've caught myself recently kind of sitting back and waiting for them to work this issue out. (#23)

An added benefit to the creation of project teams was that the project teams were co-located. This co-location cut

down on the communication barriers by placing team members together instead of on the other side of the building. The co-location also allowed for increased cross training between the different functional experts on the team. The PL for the TRSS project felt that co-location and cross training had improved his team's performance.

We've had real good luck in that we've convince the people who control the facilities here and in other areas control people to allow our team, the whole team, to co-locate. ...It is no big secret that co-location works. You get the whole team together, it improves everything, and we are one of the first groups who have done that and we got our buyers, contracts people, quality people all the engineers, manufacturing schedulers, they are all sitting in one friendly area. ...Cross training just exposes you to all the other disciplines and what the other people have to focus on. (#25)

2. As a result of teams within the competency centers becoming more self-sufficient, competency center associates are redefining their managerial roles.

While project teams draw on multiple disciplines to accomplish one task (or several tasks related to one project), competency centers have a different role. Competency centers concentrate on four areas within a specific functional area or specialty. First, competency centers are responsible for ensuring that they can provide services or personnel to the project teams. The services may include purchasing, equipment testing, or fabrication. Personnel are retained in the competency centers until a project requires their specific talents (design, engineering, etc.). Second, competency centers review and implement production processes to ensure

that the best services are provided to project teams. Third, they develop schedules for manufacturing workloads within their functional area and monitor the workloads of personnel who are assigned to project teams. Finally, the competency center is charged with the responsibility for training and career development of the personnel assigned to the competency center.

Within the competency centers a reoccurring explanation for successful teams was that the teams consists of dynamic people. Teams were seen as having their own positive aspects. The establishment of coaches assisted the teams in working through internal group processes. The ability of teams to take responsibility for their actions and to make more decisions for themselves has freed up associates to monitor and coordinate a broader range of activities. A process improvement associate (PIA), in one of Beta's competency centers, explained that teams that had been allowed to make decisions and to take responsibility for their actions were becoming more self-sufficient.

The biggest difference is that in the teams that are taking the responsibility, they have the power to make decisions now, where before if you had a branch manager, a lot of times the branch manager would make a decision and then relay that decision to the branch. ...There are certain areas, even within our own organization, where we're having a hard time letting go. But, in the areas that we have let go, it seems that those people are the ones that are participating more and taking more on their shoulders and taking off and running with it. (#12)

As a result of teams taking on more responsibility for the decision making process, competency center associates are able to redirect their efforts from one of supervision to one of coordination.

A lot of the decision making is gone. Especially in my case, because that team has really taken on a lot of those responsibilities on themselves. Which is good, then I can be off doing other things with other areas. ...The decisions aren't there that used to be there. It's more of, offer suggestions and take a look at different flows and things, and offer suggestions with the various teams and kind of do a coordination effort more than anything.
(#12)

To encourage the success of those teams taking on more responsibility and therefore freeing up associates for new roles, one Alpha PIA noted that he had changed his management techniques to be more inclusive of team considerations. He felt that his new management style made him more apart of the team than the "boss."

I've tried harder to sell people on an idea, and convince them that what I'm suggesting is the way we ought to go, rather than saying, "Here's how we're going to do it, because I'm the boss." And, I think the other thing is, it's made me more aware to try to get the ideas of others.
(#11)

3. Team members feel like they can solve problems without going through the hierarchy and that they have direct access to individuals who can provide them with the necessary information to perform their tasks.

The work group concept allows for team members to address team problems by making use of the internal talents of the team members. In the old organization, a request for

outside assistance or training had to go up, across, and down the organizational hierarchy, to obtain the needed resources. With the new organization and the increased emphasis on personnel development the teams are finding enhanced the training opportunities within the team itself instead of relying on the organizational hierarchy. A Beta master scheduler (MS) describes the following:

We've got a lot of talent within our own areas as far as training. What we're trying to do is put together a point of contact to where if we've got one individual that is the most talented on specific tasks, we're going to set up a training seminar and have them run pretty much everybody through what their task is to get them up to speed. ...One thing we have done is within our organizations, we also have what we call "grey beards." These are people that have been here for years and years, know a little bit about everything. So, if we've got an RE [reliability engineer] and we're assigning him to a program and we're expecting him to do reliability and quality issues, we're going to say, "Hey, when you come to quality issues, go see Fred. He's our grey beard." (#19)

Instead of having to communicate up and down functional organizational lines, team members feel more confident with their abilities to communicate directly with the individuals necessary to complete their tasks. Within Alpha, one PIA liked the new arrangement for communicating within the organization.

I kind of like the fact that you can go talk to anybody about anything. Because, before it was kill the messenger. You could tell your branch manager something you wanted to get to the division director, but it may never get there and you would never know. (#05)

A level one individual from Beta explained how cooperation and direct access to other organizational members has improved the quality of products at NAWC.

We had a defective slip ring from a new vendor we hadn't worked with before. We had to determine how many were defective, how many had to be shipped back, how many were correct. I pulled together 5 of us, one person from production, one from quality, inspection, and design. ...Under the old system, I would have gone to the other branch chiefs before we got to the production level. Some of them would have played power games. They would have said, "we don't see it like that", or "we don't have time to fix it, we have other important things to do." but, if I can sit and talk to people, we will come to an agreement. Previously I would have had to talk to my boss. Now we hassle it out together. We had to coordinate. Quality had parameters, production, had parameters, design, etc. It's hard to coordinate, but if we can sit and hassle it out, we come to an agreement. (#60)

4. Team members see the bigger picture (or whole process) instead of just their individual tasks.

The positive effects of the matrix organization can be found by looking at the changes in the perceptions of the individuals in regard to organizational processes and decision making. In the old organization, a person's individual task was seen as an end to itself. Now, individuals are beginning to understand that their efforts must be coordinated with the larger project for the NAWC to be successful.

Before a capacity center member only had to focus on turning out a good part. Now he's being asked to not just focus on his work but on the project as a whole, to be a contact for the team. It doesn't do any good to be a stellar individual performer when what we need is a stellar team. It doesn't do any good to turn out 100 parts if someone else only turns out 1. (#06)

This new perception of the interdependence of individual tasks has been reinforced by NAWC's management by allowing individuals to participate in decision making activities that had traditionally been made by upper management. Employee involvement in future budget considerations and process improvement processes have fostered a new feeling of "we were all pulling in the right direction," and a sense of being treated fairly in the decision making process.

From a standpoint of what's going on upstairs. It was a neat experience over the holidays we were working toward executing direct work years based on our budget, the amount of dollars we had in here. They put together a whole bunch of leadership teams to look at future marketing, to look at how do we execute, accelerate even, the direct labor. How do we get props through faster, and all this sort of thing. There was, all of a sudden I felt this combined focus and it was as though all of a sudden we were all pulling in the right direction again. (#23)

An important part of the coordination required is provided by a new emphasis on the relationship between individual projects and the larger organization's mission. The following quote illustrates how using the corporate mission provides guidance for decision making and a sense of fairness about choices that are made.

But the level three people had budgeted a certain amount of money to do these process improvement projects. ...We developed a form, I forget who developed it, but everybody wrote up the projects they'd like to see funded in this PIP operation, and then we went through and rated them, developed a series of things we thought gave it corporate perspective that we could review all these by. And, so we scored all the proposed projects, and then funded the first eight or ten of them to get started early. And thought that was a reasonable way to look like we weren't

playing favorites and that sort of thing. We weren't just picking people's pet projects because they knew somebody or were friends with someone, or whatever. And, I think that went pretty well, and I think that we all felt, I happened to be on that steering committee, we felt that we had gotten treated fairly in terms of the projects that we had turned in ourselves. (#11)

5. NAWC's management is more process oriented instead of functionally oriented.

While the budget is still a primary concern for NAWC, the criteria for the allocation of resources (money and labor) is tied more closely to processes that are required to generate and complete projects. The typically bureaucratic organization allocates resources to separate functional areas based on a number of reasons (status, cost of operation, or political clout). NAWC has made its organizational processes the criteria for its decision making. This new process orientation was described by the following three separate levels within the organization, at the directorate level (level three), by a PIA (level two), and by a PL (level one) respectively.

We are much more prone today to ask about, what is our process for getting there, to arrive at that decision. . . But I think now we're much more process oriented and data driven in the sense of getting not only the data but then taking and analyzing that data, converting it into information so we have some rational information to make decisions, as opposed to a more knee-jerk or emotional reaction. (#01)

It's through looking at processes and realizing what gets the job done is people. And by removing layers of bureaucracy it brings the people who need to work on a problem to the problem a lot faster. ...The structure is broad based enough that you can define it to meet the needs of the project without the structure defining things for the project. (#06)

Level three's emphasis on process orientation has made them more aware of the role of level one in identifying, documenting, and correcting organizational processes.

We believe the level ones are the best ones to know how to do that (documenting and correcting processes). So we had face-to-face meetings with them and asked them to document how they do business. Not how they think they do business, but how they actually do business. (#15)

In the old organization, functional separation and specialization resulted in disconnects between production processes. Design engineers may not have been aware of manufacturing limitations and technicians may not have been aware of cost overruns or budget constraints. The emphasis on organizational processes has improved the organization's ability to identify and address problem areas which before would have gone unnoticed. One project director specifically had found that the ability to identify problems within a process had improved.

Well the first thing that pops into mind is that in the old organization when a problem existed, you didn't really know about it for a long time. In the new organization you hear about it almost immediately or you see it almost immediately in terms of project execution especially. It becomes very evident very quickly where there's going to be a problem. (#22)

The concentration on process improvement has helped the organization to better understand that production processes consisted of internal customers. Internally, budget process synchronization and a balance of power between the project office and the competency centers have improved.

Our budget processes were much more in sync. I think even our budget processes last year for the '93 was much smoother than it had ever been for us to get agreement and come together doesn't mean everything's perfectly fine, but overall I think much improved. We've wrestled with process improvement things that we approve because we have to look at those corporately and which ones get funded. (#02)

What we want now is horizontal integration. Balance of power. Project office, you can't survive without us, we can't survive without you. We've got to work together. And the number one given is, we're only here to satisfy customers. Not to feed our mouths necessarily. If the work dries up here, we'd better look at downsizing manufacturing. Or design to development work goes down, alpha's going to have to be flexible with their downsizing. And with the world changing so fast, it's more important that you have a flexible organization. It's more important you understand your business, you have a corporate focus, and you're able to adjust quickly to the changing external environment. (#03)

Individuals accept that the best method for understanding organizational processes has been to document their own work processes to determine how they fit into the overall project/organizational framework. The emphasis on documenting processes was voiced by PIAs from Beta and Gamma.

I guess I was expecting more roadblocks, maybe not as much cooperation. But, they (customer service teams) have been extremely cooperative. They've put a lot of hard work into the processes and the documentation of the processes, offering suggestions where, in the past, it was they'd come in, sit at your desk, and do your job. (#12)

We have a group that's material engineering scientists. So we just let them formulate their own team. It's not a recognized CST, if you will. And so what we did is, of those entities, like the self-managed work teams we...quite frankly they're probably light years ahead of everybody else. They had their processes. Especially one of them, they had their process documented. They continually look at it and improve it. And they've reduced their cycle time by 50%. (#15)

6. Teams are learning to work with others outside of their own project team.

Project leaders were able to provide examples of success stories in dealing with other teams within NAWC. These examples pertained to a situation affecting an external customer, interactions with other project leaders, and interactions with competency centers. A PL for the SMQ11 project team cited an example of inter-team cooperation. In receiving a call for assistance from a fleet user of printed circuit boards, NAWC was able to coordinate with various groups to provide urgent material to a ship prior to its deployment.

The fleet support PL got a call and a ship was getting ready to sail on Monday and they needed a printed circuit board in order to get their system back up. Most of the people that would be able to support us to provide that had already left for the day, in manufacturing area especially. So he immediately hung up the phone, got a hold of me and asked what I could do. I went to my program engineer who was just getting ready to leave. He went out to the production floor, contacted one of the coaches that was out there and they were able to get us one of the printed circuit boards from one of the production units. We then got that back to packaging with a special request, got it packaged up. The next morning when I did a follow-up, they were getting ready to ship it to arrive Saturday afternoon. So the communication and coordination that we had with a request coming from that team, that PL, through my team, even when we had few people here is an example that worked well. (#23)

Cooperation between project leaders was also seen to be working. The constraints on manufacturing and personnel resources were two examples where inter-project leader cooperation had been successful.

In fact, one of other PLs is building a lot of my hardware along with his. So I have to talk with him constantly to find out what the status hardware is on the floor. But the floor doesn't recognize it as being my hardware. They recognize it as being his. And we do that in order to benefit from cost savings, scheduling. So yes, in that sense. I may be unique in that situation, but I rely heavily on two other PLs. (#20)

Now there are resources on my program who work 10, 20, 30, 40% of their time on my program and then they're responsible to another project leader for some other % of their time. And that hasn't created any difficulty for me yet. What that means is I go negotiate with another PL if all of a sudden my need jumped from a 10% requirement to a 50% requirement. We negotiate that at the PL level. And when we can agree on something we then tell the MS [Master Schedule] that we've reached agreement and here's how we're changing the commitment. ...You know, you give up the resource cause you know it's going to happen to you sometime. There are a few critical resources where I couldn't afford to do that. ...But for the most part, the other PLs and I can negotiate it amongst ourselves. (#20)

Another project leader cited a successful example of inter-team cooperation with one of the competency centers regarding a problem with a person who had been assigned to his project from the competency center.

I responded back to the PDA [Personnel Development Associate] and the MS that I was very unhappy with what was going on and they immediately wanted to sit down and have a meeting with the CCD [Competency Center Director], which we did. And the CCD, which was in alpha, had looked into the particular problem and when I walked in I was quite impressed. I mean he had an agenda of steps that he wanted to go through and follow and see if we couldn't resolve the problem. Got this particular young individual to realize that they didn't have to do it all themselves, they could get somebody else to help them. So that interchange with that CC was very good. (#23)

Inter-team cooperation within the competency centers was seen in a positive light. Experiencing a problem with workload distribution in one competency center, one PIA in

Beta had seen personnel from another team assist in sharing the work tasks. This cooperation was accomplished at the team level instead of having to be routed through the old organization hierarchy.

Another good indication is the personnel moves. A shortage occurred somewhere and if we're getting overloaded in packaging, let's say, the packaging team will approach another team, say, "I'm overloaded, overworked at this point. Would you guys be able to provide some support over here?" (#12)

An important aspect of inter-team cooperation was that it could be initiated by an individual team member. An Alpha master scheduler was approached by an individual on a project team about being transferred. Because of the flexibility of competency centers and project teams to handle personnel problems and to interact effectively, the master scheduler was able to get the cooperation of the personnel development associate and project leader in address the individual's problem.

I had a fellow come to me who was saying that he wasn't too happy with what job he was working on, as an example. And it didn't appear that the PL was too happy with what he was doing. So there wasn't a good match there any longer. So the issue there as far as I was concerned was we needed to find a different job for him or we had to at least straighten out what the situation is. So naturally I'd get the PDA involved because it has to do with a person's development. ...First I was talking to the individual by himself. Then I got our PDA involved. We talked about it. After that our PDA and I went to our director to make sure he was involved with what was happening and all of us worked the issue. ...the PL was brought in within the week and started working the issue and it turned out that we released that person from the project that was supporting him because thing's were not working out. (#16)

7. Members of the LTD (Level Three Directors) are committed to finding ways for the AGO and Command Staff to work together.

Alpha, Beta, Gamma, and Project Office (AGO) were established in April of 1992. The Command Staff organization was not implemented until January of 1993. The distinction between the AGO and Command Staff followed the traditional lines of operations (production) and support (comptroller, personnel office, graphics support, etc.). As the emphasis on organizational processes and team development have grown, level three has become more aware of the necessity to tear down the walls separating the AGO and Command Staff. While they have not been completely successful in replacing the two groups of AGO Directors and Command Staff Directors with a single group of Level Three Directors (LTD), they did provide a positive example of inter-team dynamics by demonstrating a new awareness for the importance of the AGO and the Command Staff to work more closely together.

At level three, I think we have a lot of work to do. As I started off this meeting saying, I think it's a mistake for us still to be talking about AGO and command staff or "six pack" or whatever you to call us. We should be calling ourselves the LTD, the Level Three Directors. Because as long as we talk about command staff and AGO, you're talking about the operations and the support functions. And you're not moving as one team. And, we really need to break down that barrier. That's historically probably every organization that's ever stood up within the Department of Defense. You have those operations people and then you have the support people, those indirect people that are over there just sucking up all that money. What do they do anyway? We've come a long way from where we were 2 years ago. We still need to

break down that barrier of calling command staff and AGO.
(#02)

8. Corporate information is being disseminated adequately from level three to level two to level one.

One of the most significant positive inter-team interactions was the downward flow of corporate information (information concerning personnel reductions, base closure, etc.). A major concern of the level three personnel interviewed was whether information was being received at the lower levels. Various approaches by upper management had been initiated to improve the downward flow of communication. Appendix F contains a Communication Matrix for NAWC. The speed of disseminating corporate information from the upper levels of management to the lower levels had improved since the reorganization.

One of the strengths that I saw coming out was the communications we needed and actually getting the word down from Bob Barnett [Executive Director] to the level ones within the same week. (#21)

Roundtable meetings were established to facilitate the flow of information between level three and level one. These meeting are held by level three directors and randomly selected level two and level one personnel are invited to attend. These meetings are an open forum type of presentation with the level three person providing some basic information and allowing for questions from the personnel attending the meeting. While they have not been held as frequently as promised, they have provided an opportunity for level two and

one personnel to interact with level three managers. A level three manager comments on the results:

In the roundtables it's apparent that some of the messages are getting through pretty well, because like I said I had 1 or 2 folks in the last few sessions to say that communications are much better. And, there aren't nearly as many questions about things that I'm sure that I communicated to the CCDs and that I was expecting them to communicate to the other folks. (#04)

Competency center meetings are the primary arena for the distribution of corporate information. Since everyone is assigned to a competency center (with the exception of the project director and project area leaders), the competency centers are held responsible for ensuring that information is disseminated. There have been some problems with arranging for all personnel in a competency center to attend meeting (sizes can be as high as 120 people), but the general consensus is that the competency center meetings have been beneficial.

I know since we have established the communications meetings it has been a real handy meeting to add riders to what is going on in level one. (#21)

Well, I think its working better than it was in April, because we didn't have any communication lines other than one on one, if we happened to see somebody or if they had a question and come to us. At least once a month, we're sitting down with an open discussion type atmosphere. I don't know if that's enough or not. We've asked the people in our small groups, "Do you think this is working?" Most of them say it is. (#19)

C. CHALLENGES STILL FACING NAWC

1. Many teams are struggling with learning how to work together as a team.

This is particular true within the customer service teams (CSTs) at level one, where there is less experience, not much guidance, and little or no project focus. The lack of a consistent organization and identifiable points of contact within the CSTs has contributed to the frustration felt by project teams and competency centers. The primary focus of team development within NAWC has been on the project teams. More recently, the competency centers and customer service teams are establishing self-managed teams in their respective areas. The teams in general were all positive about the role of teams in the new organization. However, the following provides some shortcomings in team development that were identified in the interviews. This section is organized by the themes that were identified within each of the directorates. However, some of the issues were found to exist in more than one directorate.

a. Project Teams

While the project leaders (PL) were positive about their own empowerment, they felt that there were limits to the amount of empowerment that should be given to team members. The TRSS PL felt there was a problem with the credibility of NAWC's leadership because no "credible standards" had been

established for team members. This guidance or standard could be used to direct the actions of the team members.

The dilemma is if I ran a destroyer and I empowered everyone to do whatever they thought was right. Where would that ship go and what would it do? And, that is what I think we have here, everyone is empowered. But, there is no real credible leadership, there is no credible standard that one could gather around and say that this is my purpose in life. ...Yeah, you go say why can't I get this done. They say, well those guys are empowered. They can do whatever they think is right. If I tell them my job is right and the next guy, who may be legitimate, tells them his job is the right one to be working on, who calls that then, who calls the difference? (#25)

Another PL was concerned that there was not a feedback loop between project teams for lessons learned. This was seen to limit the ability of teams to benefit from the mistakes of other teams. In light of the possible temporary nature of project team life cycles it could doom the teams to repeating the same mistakes since there was not an established mechanism for sharing team successes.

We have talked and talked and talked over the past few years about lessons learned, but I have never seen anyone really close the loop and publish what they learned. You know they share it amongst their team, but don't publish it so everyone else can benefit from it. (#20)

b. Alpha Directorate

Within the Alpha Directorate problems were identified relating to team development. A level one individual stated that team members have to become more accepting of responsibility. Team members have to be willing to share accountability for their decisions.

Until they (teams) get to the place where they pick up and can make the decisions themselves, the amount of authority

they have depends on how they accept it and how they use it. And, as they begin to learn how to accept and use authority, then there's more authority that comes down. (#34)

Discipline within the team was seen as a problem by one alpha respondent, because of peer relationships. The daily face-to-face working relationships made team members uncomfortable with confronting poor or badly performing members.

And, I think as a team, we've come to recognize that there are things that we don't want to make a decision on like internal discipline. ...But, when you have twelve people that you work with everyday and you say, "Wait here, Bob. You're way out of line and you're going to have to do this or we're going to have to take it up a higher step." And, then that creates hard feelings and you have to work with this person everyday. So we would rather that the, those kinds of decisions or actions be taken by someone up above. (#34)

Another individual within Alpha felt that the teams had not learned the mental tasks of consensus management and self-managed teams, because no training had been provided to the teams prior to the reorganization. This lack of team skills has resulted in a reliance on old standard procedures.

Yeah, they need to get people to learn to do mental tasks that are consensus type, self-managed. They need to develop the mental skills that are working on self-managed teams, and right now it's just been given to me, and said you are a self-managed work team, you go and do your work. Nobody's told them what that means. Nobody told them how they should be managing themselves. What does it mean to be self-managing?We're at the stage of running the sidewalks the way the architect wants them to look pretty and building fences around them so people don't wonder off onto the grass. ...people are realizing that the sidewalks don't take them where they want to go, but haven't figured out how to jump over the fence and run across the grass. (#31)

A stigma of being assigned to the CC (verses being on a project team) was identified during two of the interviews. This stigma has a negative impact on the team development within the competency center. If individuals are more concerned with getting out of the competency center than improving it, their efforts will be directed toward finding a new project team. This decreases their identification with the competency center and their loyalty to it. A project member from Alpha directorate stated:

And, something that I talked about that I'd forgotten until now, there is a stigma attached to being in a competency center and not assigned to a project. And, I think that part of that stigma could have been avoided or made less of a stigma if when they did the reorganization, those people that didn't fit, hadn't been put in there. No matter whether they had been managers before or not. If they had been a manager before, they found something for them, rather than putting them in the competency center. (#35)

c. Beta Directorate

Beta's primary mission is to provide logistic and manufacturing support for project teams. Few of Beta's personnel are actually assigned to project teams. Alpha provides the bulk of personnel to project teams, because of its design and engineering specialties. Gamma concentrates on quality assurance, environmental testing and fleet support. As a result of the different functional areas, Alpha and Gamma have the benefit of seeing the development and usage (by fleet personnel) of a project. Beta, on the other hand, is still focusing on productivity levels within their competency

centers. The employees operate as members of teams referred to as capacity teams, because they provide manufacturing support to multiple projects rather than being individually assigned to a specific project.

Beta provided contrasting views between respondents. Three of the interviewees were in customer service teams (CSTs) and four were Area Process Coordinators (APC). The APCs are project team members (from Beta) whose job it is to coordinate project work within the Beta competency centers. Different perspectives were provided by these individuals.

While the CST members were positive about their teams, they did state that some of the level two associates were still acting like "bosses" and not willing to let the teams go on their own. A contributing factor for some of the associate's over involvement was the excess number of competency center managers. The CST members criticized the competency centers for being top heavy. They felt the reason for the competency centers being top heavy was that room had to be made for the old supervisors in the new organization.

Personally, I think the management is too heavy in here. It's too much management. Now that they've changed things around there's no supervisors except for the heads of the departments. ...I don't know what they did with all the engineers that are still here. I just think they made them PDAs and PIAs. ...I think they're heavy there too. Why do we need four PIAs in our group? We get two PDAs. Why do we need two? (#40)

Despite the CST member's concerns over the intervention of "bosses" in their teams, they identified negative aspects of the self-managed team concept. As with Alpha, personnel discipline was seen as hard for the teams to address, because of the peer relationship.

Discipline's one. We cannot handle any discipline right now. If we know somebody's doing something, all we can do is tell them about it, as far as a group coming up. Because others may be doing the same thing, and we're not catching that. Everybody gets real defensive. So, that's kind of a bad item, and we haven't worked around that yet. I don't know if we ever will as a team. It's kind of tough, equal members disciplining other equal members. (#37)

Concern was voiced by two respondents that they were being asked to accept more responsibility and capability without any additional pay. They perceived the reorganization as means of extracting more work for the same wages. The lack of monetary reward was seen as an impediment to accepting greater (or broader) responsibilities. This concern was only mentioned by Beta personnel. A reason for this may be past emphasis on capacity production. Since these individuals have always been judged by their individual performance, and little training has been provided to them on the function of self-managed teams, it is not a surprise that team development is seen as an addition of tasks and not a redefinition of their job descriptions.

Well, they don't have any openings for people to come from the outside. They haven't posted any new positions. They haven't come up with any new positions. So, I think what they want to do is cross-training where they can detail people in different areas. In other words, have people

wear more hats, take on more tasks. Be responsible for more. ...A lot of people are going to reject the idea given more responsibilities without any monetary, like getting any more pay for it. ...'cause I've seen rejection already to that. Not rejection, but people kind of bitter about it. Why should they do more and not get paid for it? (#40)

Right now, it's mainly the cutting back. And, they say they're going to redo everybody's job, basically, incorporate more layoff people and incorporate you to do more work without promotions. ...Maybe they might want me over here for three weeks and they could work it so, you're going to do this, even though it might be an engineering job. Therefore, they have given me no promotion or anything, but I'm still going to be doing an upper level job. (#37)

Beta members viewed team processes as frustrating and stressful. While wanting the authority to make decisions, they tend to look for leadership from managers in addressing group issues. Active participation in group processes is not seen to provide good solutions, but increases the level of group conflict.

It's frustrating. We designed this conveyer system to go up and down the aisles. We put this bracket in along the floor. We had it figured out that it was a three stage process, there would be no down time. The machine repair people had all kinds of trouble with it because they thought there'd be electricity along the ground. They complained to the PIA associate and he said that we had to come up with a compromise. We had this meeting. It was very frustrating. This problem had been there for three years. I could have just done it and gotten it over with. They wanted the bracket on the other side. One of them said that they'd even make it. Three years ago they would have said, "We don't do design work." but, if they're motivated, they'll do it. They're motivated now because they don't want to step over the bracket. So they designed the bracket. I know those guys. In the old organization he wouldn't do anything. He'd do a drawing even if he knew it was wrong. It seemed like just another delay, but at least we have a compromise. The only thing I deal with now is ideas. I have no other currency, no

authority. The large group is difficult because there's usually someone against the ideas.

The Area Process Coordinators (APCs) were more negative about the success of intra-team process within Beta. They felt that the competency centers were still possessive of their processes and were not flexible enough to change when required. The competency centers did not have a global view of their work and as a result were not as cooperative as they could be. Three of the four APC discussed the limited perspective of the CSTs.

For instance in MDA (Mechanical Devices and Assembly), they think, "we know how to handle our business the best so we'll just launch out and do it. And, we won't be accountable to you until we've been proven to be wrong." For example, we've gone out to CCs to voice a concern and you get the feeling they're saying, "Don't come to us with this now, until the problem is actually there, then we'll take care of it." I don't think they're very proactive. They're still reactive. They will talk to you and address a problem once it's occurred, but they won't make plans that are proactive that can prevent it from happening to start with. (#39/1)

We're running a program. And like MDA, they think parts are parts and they don't care about the program and the whole like we do. And, that's the new organization, that's what I don't like about it. In the old organization, we had control over our part from the day they came in until they shipped out. We've lost a lot of that control. (#39/2)

While we're looking at a global view of the program, a lot of times they're looking at an isolated piece of it and only worrying about that little isolated piece of it. (#39/3)

Technically, the APC criticized the competency centers for not being good at planning and meeting work schedules, and for not being able to accurately account for

costs. The APCs did acknowledge that a cause of the CST's problems was that team training for the CSTs was two years behind the project teams.

One problem I see, the concept I believe in, I've had some outside training in these areas so maybe its easier for me to buy into it. As each of us got more training and became more aware about what was happening I think our buy in increased. But, this training is sort of trickling down. And, I don't think the training that's needed or the explanation to the people actually doing the work has actually filtered down that far yet. And once you've got the concept you've got to go through the growing phases of sub-grouping; storming, forming...and hopefully you get to some degree of synergism and hopefully you're doing good work. Well at higher levels maybe its happened, and then it comes down a level and they start at square one and maybe it happens for them, and then it comes down another level and they start at square one...Whereas it would have been better if we could have all started off and maybe we would have already progressed through these stages. But, we have some people in the plant who haven't even started forming. I think the forming stage is just beginning at the worker level. (#39/3)

There's a 1 1/2 or 2 years difference in opinions about how things should be working. According to the project office, given how long they've been working on this it should be working like clockwork by now and some of these people are just now forming teams, they're just beginning. (#39/4)

d. Gamma Directorate

While teams were just starting to develop in Gamma, one respondent felt similar to the Beta CST members that some managers had not let go of the old ways of managing. The overshadowing of the teams by old supervisors was seen to be stifling team development. In discussing self-management, one individual commented:

When that [self-management] happens that will be good. But, we're not being turned loose as teams yet. Right now I'm seeing the same "no we're not going to do that." I

love it when they say, "sonny, we've done that for 20 years and you're telling me it was wrong?" And, I say, "no sir, I'm not telling you it's wrong, I'm just saying this is better." If they turn us loose and they mean it, it will be better. If they just bless us and say we're a team and still stifle creativity, it's the same old stuff with a different name. (#42)

Another respondent felt that the directions from associates in one CC were considered vague and resulted in wasted effort. The problem was that the associates were not specific enough with their directions. This required the team members to produce large amounts of data that were not acceptable or only partially utilized by the associates.

I know some of the feelings within our group, as far as level two is concerned, people just want to be left alone to do their job and now they're getting tasked with a lot of the management reports and things like that, that they really don't...They're getting really bogged down with these things. ...We personally have gone through some recent scares and report issues between us and Crane in terms of their environmental test capabilities; comparing facilities. ...But, I know a lot of that information got condensed down, some of it even was dropped out of the final thing. so, we had people pulling fire drills here that basically, the stuff was dropped. ...Yes, it was just kind of this vague thing; we're going to get everything and anything that we can and we'll do whatever we have to from there. (#43)

2. Competency centers and project leaders are having trouble interacting effectively.

The reorganization established four directorates (excluding the Command Staff). The role of the Alpha, Beta, and Gamma directorates is to provide personnel, technical, and manufacturing support to the Project Office directorate. In NAWC's matrix structure, personnel are pulled from the competency centers to work on specific projects. These teams

remain in existence for the life of the project. Upon completion or termination of the project, the personnel are returned to the competency centers to be made available for other projects. The role of the team members is provide technical expertise to the project and to liaison with the Customer Service Teams (CSTs) for additional support (ex., manufacturing, environmental testing, etc.). This matrix organization requires that project teams and competency centers interact on a continuous basis to obtain needed personnel, material, technical, and manufacturing support to successfully complete project goals.

This interaction has been a struggle for many individuals. Conflict has arisen over the perception that unnecessary work is created by the CCs, process inconsistencies in the CSTs, a lack of ownership for process improvement, indirect funding, and competition for resources.

a. Project Leaders feel that Competency Centers cause Project Leaders unnecessary work

The project office felt that any new program or process review by the CC seemed to increase the workload of the project office/teams. The PAL (Project Area Leader) felt that information requested by the CC was overburdening the project office.

Now that these CCs and PDAs, PIAs, CCDs, plus all of the action teams that are supposed to be looking at some of our more systemic problems, every time we turn around they're asking us for information because, quote, unquote, they don't know. OK, so now these PLs are inundated with

requirements with "what is your plan, how many people in my CC are you going to use, when are you going to use them?" It becomes a data nightmare to some extent because now all those new needs for information are focused on the PLs and PALs. (#18)

b. Process inconsistency in the CSTs

Some project leaders who were interviewed were also critical of the customer service teams in the competency centers and their inability to provide consistent, clear procedures for the CSTs. This inconsistency was viewed as negatively affecting the project teams. Since the project teams need to obtain services from the CSTs, they were frustrated by the constantly changing rules and procedures for requesting those services. CST process changes slowed down the project schedule and required project teams to learn new procedures and to resubmit requests for the same services that had previously been provided. In addition to the frustration over inconsistent process requirements, the lack of an identifiable point of contact on CSTs was seen as a problem for project teams. The project teams were unable to consistently talk to the same person within the CSTs to obtain current directions or to resolve existing problems.

One is the proposal process. I think it's a necessary thing, but I think the way we're implementing it, it's not the most efficient. To put the prop together for last year we had to have each individual put together their own green sheet and then a supplementary list of tasks of what they were going to do. It was time consuming to coordinate all that because I have 18-20 folks, with all the different CCs represented, you have deal with the MSS from each one, each one had a little bit different requirement as to what he wanted to see. (#7)

Absolutely, you have to relearn how to do it every time you do it. To a production house, that will kill you. You have to know that if I do this design this way that the printed wiring board people can get me boards back instantly or if I request material this way that the supply folks would assign it to the buyer and the buyer would buy it and follow up on the purchases and I will have the material. Well, it is not working. (#25)

c. Lack of ownership for process improvement

The project office voiced concern that some of the competency centers were not taking ownership for their processes. This lack of ownership negatively affected the projects because of the need for project teams to obtain services from the competency centers. The project teams have no control over the processes within the competency centers. They felt that if the associates within the competency centers would take greater ownership for their process, the problems of inconsistent procedures, and poor service would be eliminated. A PAL echoed the concern for a lack of ownership for production and organizational processes in some of Beta's competency centers.

There should have been PDAs, PIAs, CCDs who were somehow motivated to deal with this issue rather than my having to get involved in it. What I'm finding is that if there is any downside to the reorganization, it is that with the way its been implemented, there no longer is a feeling of ownership of a lot of these processes. ...And, as a result of that, they're not, in my view, they're not as motivated, if you will, to go out and confront some of these issues. (#18)

The issue of lack of initiative and ownership on the part of the competency centers and CSTs was also perceived by project leaders.

We invited her to come to the meeting to talk about a problem we were having with terminals--installing terminals on boards. And she had some info at that meeting. But they had never measured their process. So I was asking some questions about how they were planning to go about doing this, was there anything we could do. We could help run a test case or something. Well I was disappointed because then last week she didn't show up. (#23)

Beta competency centers were noted the most often by the respondents as the directorate with which they were the most unhappy. Since Beta's primary responsibility is for logistics support and manufacturing support, they are primarily capacity operated CSTs. This means that the CSTs are given a continuous batch of jobs to perform for the entire organization (ex., ordering material requirements, or operating a drill press). These functions are repetitive and are not cost effective to be given over to the project teams. As a result, the focus of the CST has remained on individual productivity. Concentration on individual productivity coupled with organizational attention on project teams has hindered the development of self-managed team skills within the CSTs. The problem as identified by the project office is that these CSTs are more concerned with their own functions than the success of the project.

You've got the project office here, and the competency centers here. Our concept of operations says that you have the project team here. And, you have this support leg coming from the competency centers and the project office. Their jobs are to support this project team so that they get it done. In Alpha and Gamma, what you would see is, say 90 per cent of the people would stand up and say, yeah that's the way it is supposed to work. In Beta,

what you see is I have this wall here from the project team to the CST. (#22)

Because of the project teams' direct contact with the project sponsor (or external customer), the project office feels a great sense of pressure to complete the project on time and on budget. A project area leader (PAL) felt that the competency center's apathy in accepting ownership of their processes was due in part to a lack of appreciation on the part of the competency centers regarding the pressures on the project office.

There's been a significant increase in day-to-day operations of the project office like this. Its up to us, we're the ones who seemingly have the ownership of the program and who care about what happens today and what happens tomorrow, and are things running smoothly. We're the ones going out and finding these barriers. Then it's a question of well, "who can we draw in to fix this?" And, one of the byproducts of the reorganization is that I find myself working across the board at a level to solve some of the day-to-day problems that I previously, as a program manager, would never have gotten involved in. Only because we have to be successful. If no one else is going to deal with it, ultimately we do. Because we're the ones who answer to the sponsors for the results. (#18)

d. Direct verses indirect funding

As with any manufacturing organization, labor cost must be accounted for using direct and indirect funding procedures. NAWC's project teams have become more aware of the financial constraints confronting the organization. Since direct funds determine how many and which personnel will be employed, the products of the project teams provide the financial blood of the organization. A problem has developed because the competency centers, which are responsible for

improving manufacturing processes and for purchasing new equipment, are funded with indirect funds. This awareness has lead to conflict regarding the use of project funds to support indirect activities. Competency centers are trying to obtain as much funding to support process improvement, while the project teams, who have to answer to the project sponsor for cost data, are trying to keep costs as low as possible. This conflict has resulted in very negative feelings about the extent that competency center personnel will go to charge indirect costs to project team direct funds.

Everyone who is indirect is getting a lot of indirect pressure to burn your overhead or "burn out." I don't know what phrase your familiar with. They are getting a lot of pressure to do what ever they can and you can read this anyway you want. To get off indirect you get on a direct job order, direct funded job order like the TRSS program. And, TRSS is a big target because we've got millions and millions of dollars and we got 500 different job orders so a guy can make a mistake on his labor card and probably hit a TRSS job order. One area went as far as to post all the TRSS job orders up in their area and told the people before you charge indirect, you hit one of these job orders, that is illegal. So we went back and pulled it down, but they put it out on plant mail anyway back to the group. (#25)

One of the conflicts I suddenly find myself in, I find myself kind of strong on, is essentially, what this boils down to, is being a spy. Although they didn't use that word, but it all boils down to being a spy, to figure out what the funding status was. ...They have their people to employ. They have their, ... they need so many man hours to keep the people in the competency center paychecks coming. They want to reach in and grab as much work as they can. (#13)

e. Competition for resources

Not only has the issue of indirect funding been a cause for conflict between the project teams and competency

centers, a competition for existing organizational resources also exists between the competency centers and the project teams. The competency centers have been tasked with process improvements and supporting the projects. But, the cost of that has not recognized by the project teams.

I think they do think that indirect is not very important. And, I think that probably stems from the fact that, naturally, we want to get everybody off of indirect and put them on direct, as much as we can. However, even if we were fully loaded and everybody was on direct, and so forth, we still have to improve these things. (#16)

The need to improve production processes and support project teams combined with scarce organizational resources has created competition between the project teams and the competency centers.

Computers are a big tool here as far as helping us communicate and helping us do our work. The organization because of budget cuts basically doesn't have indirect money to buy those, some project teams are fairly wealthy and they can buy that kind of stuff for their people and that creates a problem with some of our people as far as some feel inferior they don't get the same access. (#13)

People typically on project teams are assigned direct work. The things we're working on are more or less indirect that support those direct line processes. But, we're competing for the same resources and it makes our job a little bit hard because we don't have the people that are familiar enough, or take the initiative, or who can follow our way.The Project Office feels that some of the processes we're working on are things they don't need to be aware of, because they're only results driven. But, I think they do need to be aware because we do something that significantly reduces the turnaround time on that product. (#5)

In summary, consistently, the greatest amount of conflict was between the project teams and the CSTs. The areas of conflict involved the issue of constantly changing

procedures, funding issues, and resource competition. The leading cause of conflict with the CSTs was seen as the inconsistent organizational processes and procedures within the CSTs. Because each CST was developing its own processes at its own rate, project teams were confused about how they were supposed to interact with the CST. This confusion created waste in learning the new processes and waste in redoing old processes that had been changed by the CSTs (e.g., proposals). The issue of direct and indirect funding was the most visible conflict measure. There seemed to be no corporate justification or consistent policy in managing overhead charges. If a policy does exist, the project teams were not aware of it or were not accepting it. The projects were very concerned with how these indirect cost were effecting their projects. The competency center managers were seen as inappropriately using direct funding to cover their own position and the excess capacity in the competency center. Comments were even made by competency center members that the competency centers were top heavy with indirect management. The competency centers did feel that they were in competition with the project teams for hardware and personnel resources. Since the tasks of improving the equipment and processes did not receive direct funding, the better corporate equipment and personnel were on project teams. This conflict has made process improvement secondary to the project team's objectives of project completion on time and on budget.

3. NAWC is readjusting its formal flow of communication to adapt to the new organization.

NAWC has changed from a traditional bureaucratic organization to a matrix structure using self-managed teams. In its old structure, NAWC's lines of communications were typical of most organizations. Communication traveled primarily along the organizational structure. Information being passed downward from upper management was distributed via the functional area managers or department heads. The same is true for information coming from the lower levels in the organization. A person would pass the information along to his supervisor, who in turn would pass it along to a manager until the information was received at the appropriate level. For information to travel between functional areas, the official route was for a worker to refer the information or request to his supervisor, who in turn would pass it along to the next level supervisor until a comparable level supervisor could be reached in the other functional area. The information would then be passed downward to the appropriate person in that functional area.

By eliminating their bureaucratic structure, NAWC was no longer able to pass information along the old communication network. With the new matrix structure, where temporary (short and long term) projects exists, horizontal communication has taken on a more significant role. Three challenges with NAWC's new communication network were

identified in the interviews. They pertain to concern for removal of the organizational structure, the types of information flow, and the responsibilities for corporate information flow.

a. Concern with lack of hierarchial organizational structure

Both level three and level two respondents utilized assumptions about organizational structure to formulate their opinions of NAWC's communication effectiveness. Level three made reference that the removal of line supervisors had changed, if not reduced the quality communication flow to employees.

There was a significant gap in communication because we had taken away the first line supervisor. (#10)

There used to be this line manager, that had anywhere from 8 to 20 people working for him. And he provided a lot of different personalized input. Now some have 120, 200 it's very difficult for them to provide that level of personal communication. (#10)

Level two interviewees were also concerned with the effect of the new structure on communication.

There's no direct pathways to anybody. There's no structure for the communications between people. So things that used to have a path of being communicated is just filtering through the system, not necessarily organized. (#5)

Level Three felt that this lack of structure was seen to be causing problems for the level ones.

The biggest problem right now is that level ones are going to wherever they have to get the information they want. The official way is they come to the CC. People have been thrown into CCs with administrative people that they may

or may not know and may not feel comfortable going to those people for that type of information. (#5)

The effect of structure on the communication process was not shared by everyone. A level three and level two respondent did comment, that while the structure was different, it did not necessarily relate to quality.

So I'm not saying it's bad. I'm just saying that's what makes it different about communications. So, I don't think a lot of us have figured out quite how to do that.....we can't depend on the organizational pyramid. (#4)

My personal feeling as far as our particular CC is concerned, I think the communications between Level Two and Level One has been good. I base that on, we ask that question continually of our people, what they think, and they seem to be happy. And like I said we pass the information back and forth or ask them to get with the PDA, depending on what the situation is, or the PIA. I think in general people know who to go to for specific questions they might have or specific issues they might have. (#16)

b. Types of organizational information/flow

The main concern of the level three respondents was that corporate information (downsizing, reductions in force, personnel issues, and organizational wide information) was not flowing downward in the organization. The concern was with whether the employees were receiving and accepting the information from the executive level and level three.

The organization isn't working the way it should be working after three years. And, we're not getting information down to the Level One people. (#10)

Not nearly enough time is spent communicating directly to Level One. (#4)

Concern with level three's preoccupation with downward communication was expressed by two of the level three respondents. They felt that the concentration on downward communication did not align with the goals of the new organization. The organization was restructured to include more people into the decision making processes. The goal of communication, as viewed by these individuals, was to expedite the flow of information from level one to levels two and three. The continuing focus on downward communication was seen as a carry over from the old organization and was having a negative impact on productivity. If the communication network was working overtime to move corporate information downward, it would not be able to convey process information upward.

I think the same thing happened on the other end, that communications coming from Level One to Level Three have broken down somewhat, or are not at the level required to make this organization work. (#10)

And I still think we have a paradigm here that we're talking about getting stuff down to people. And yet we say our concept of operations is the inverted pyramid. I don't really see that in communication because I don't see that many Level Ones really involved. For them to communicate, they have to be involved in the teams that are deciding how we do some things here at the center. So they still haven't seen this inverted from their standpoint, because they've never been asked to be part of the communications flow the other way.Getting it back up is really going to require a kind of a change within the people. (#2)

Three of the level two respondents also felt that upwards communications from level one personnel were lacking. They were concerned that they (level two) was not getting

enough feedback about the corporate information that had been passed down to level one, and that level one was not contributing to the reorganization by providing process input (unless questioned by higher levels).

I don't, in all honesty, get a whole lot of information coming up. (#13)

To be honest with you though the communications back from Level Ones to us hasn't been outstanding. They've always asked a lot of questions about what we're presenting and stuff like that, but we don't normally get a lot of feedback about what's bothering them. (#16)

But you know what kind of bothers me, and this is the technical kind of thing. If you look at it they talk about flow down from Level Three to Level Two to Level One. That's the standard. ...They've flipped into their paradigm and gone right back into the hierarchy flowing 3, 2, 1. There's mixed messages. (#15)

Overall, levels one and two were satisfied with the corporate information that was being passed down the formal communication channels. However, some of the respondents were concerned that the number of communication meetings outweighed the information.

It doesn't work because every meeting turns out to be not so useful, no new information is shared. People start skipping the meetings and not caring about the meetings. If it's once a month, there's new information to talk about. (#8)

You know, the only thing is sometimes it (weekly communication meeting) is probably too often. There's not a whole lot of new information. (#44)

Similar to the concerns voiced by the level three managers, regarding too much emphasis on the downward flow of corporate information, level one respondents did voice some concern over level three's lack of ability to communicate

about production processes or work activities. Upper level managers are seen as isolated and out of touch with the actual processes taking place at level one.

It makes life a lot more simple for us that they don't get involved, if you want to consider it monkeying around in the program. But on the other hand, they've gotten themselves isolated enough to the point where they don't know what's going on, and what's really driving things down at the working level. Even though we have fewer levels in management now, I think they're more isolated now than before we reorganized. (#35)

I really couldn't tell you much about level three, because I never see them enough. But, they're supposed to come out and see how we work in our areas a lot of times, and every time they end up talking to the director or the competency center director, and they never do make it out into the areas and see what we really do. ...I wouldn't say it's recognition, I'd say they don't know what's going on. They have an idea. If you would ever listen to some of these tours going around, and some of the things that they're saying about certain jobs, it's kind of laughable. I have to kind of walk off, because they really are just B.S.ing a lot of the way through because they don't understand what it all is. (#37)

c. Corporate information responsibilities

An interesting side issue was noted about the communication process. The project team and the competency centers held different opinions and perceptions about their effectiveness and their counterpart's effectiveness in providing corporate information. As mentioned above, the competency centers felt that the downward flow of corporate information was working well. However, some project leaders held different opinions. The project leaders saw their role in the communication process as being the communication of project specific issues.

I have very little communication with my team on corporate issues. Most of the time, I have conversations with them and we communicate issues from a project standpoint. In other words, "this is a task that we have as a project team, to get this information together to go do a presentation for a WEB (Workload Evaluation Board meeting) or for a kickoff." (#23)

I try to avoid passing down corporate information as much as possible. The only information I pass is what the team's doing as a whole, what props we've got in to the sponsor, areas trying to develop. ... The problem is, early in the reorganization, CCs were saying one thing and the Project Office was saying something else. So, I thought we should focus more on the job and let the CC take care of corporate information. (#6)

Some project leaders saw a breakdown in the communication process in the competency centers and decided to include corporate information in their team meetings.

The person on the project team, the person that they see on a regular basis and the person they identify themselves with, now is the project leader, because that's who they're assigned to full time. So, I have taken on the responsibility, in my weekly team meetings, those used to be all project oriented, well now I take the first 10-15 minutes of my meetings to pass on corporate information because they're not getting it from their CCs. (#20)

Unfortunately, given the way the CCs are structured they're responsible for so many people, it's difficult for them to reach all the people. Some of the CCs have intermittent communication meetings and other CCs don't have any. And so center-wide, the "what is the center doing" kind of information doesn't seem to be there any more like it used to. (#7)

Communication was seen as a process that is ongoing and vital to the organization. Level three respondents felt they had contributed large amounts of time and energy to improving communication. However, they could not clearly define or measure communication processes. Level three concentrated on the formal communication channels

(directorate/team/ competency center meeting, roundtable discussions, newsletters, and computer E-mail) to convey corporate information. Level three's efforts appear to have met with some success. Their concern for downward communication was not shared by the lower levels. Generally, each level felt it was receiving corporate information as well as could be expected. There were personnel concerns with such issues as RIFs and forced retirements, but these were mentioned more out of personal anxiety than a lack of information from level three. The more telling aspect of communication flow was the feelings in regard to upward communication. Some respondents from levels three and two were concerned that they were not getting enough information from level one. While not clearly stated, these concerns were over (1) what is bothering the level one members; upward flow of downward corporate information, and (2) the need to get level one more involved with the process decisions. At level one, a feeling stated by respondents across directorates was that level three was not aware of their processes and needed to walk around more often to learn what was going on.

Horizontal communication was interesting in that a difference of perspective was highlighted between the competency centers and project teams. The competency centers felt that they were providing corporate information to their people. They also felt that the project teams were providing the same information to ensure everyone is receiving the

information. The project teams felt that they should only be concerned with project specific information, but since their team members were not getting it from the competency centers they were using project time to pass on corporate information.

D. SUMMARY

NAWC has had mixed experiences with its reorganization. On the positive side, teams voiced a feeling of working well together and that they had been able to implement better solutions. As the competency center teams have become more self-sufficient, associates are redefining their managerial roles to become more of a monitor and coordinator. With the increased access to necessary information, team members feel that they are able to solve their own team problems without the assistance of the management hierarchy. Team members are looking at the "big picture" of how their individual tasks fit into organizational processes. This has been reinforced by NAWC's management who focus on organizational or production processes as criteria for decision making. Teams are recognizing the importance of inter-team cooperation in meeting their project goals. Upper management recognizes the need to break down the barriers between the old operations and support functions by moving to a Level Three Directors concept. The most significant positive effect has been the flow of corporate information downward from level three to level two to level one.

Challenges still face NAWC. Many teams are still struggling with learning how to work together as teams. Conflict is still very strong between the competency centers and the project teams. These groups are having trouble interacting effectively. This is due, in part, to lack of clarity regarding the management of direct and indirect cost activities. Additionally, the organization has not clearly visualized or implemented a communication network that corresponds with the new organization.

Although the intent of this paper was not to test the hypotheses presented in Chapter III, the themes identified during the interviews did reflect some of the ideas presented by the hypotheses.

(Systems perspective). NAWC-ADI has focused primarily on structure and process orientation during its reorganization. They have not addressed the interaction between their new matrix organizational structure and other organizational components (such as personnel appraisals, promotions, or rewards). As described in Chapter III, organizations contain systems that interact and impact on each other. If one system (structure) is changed, the other systems will be affected. NAWC-ADI has tried to define their new organization by being process oriented. However, this orientation has primarily focused on production processes and has ignored such systems as human resources, informal communication, and feedback processes.

(Frustration) The reorganization has created some negative reaction among NAWC-ADI employees, but personnel interviewed were able to point to specific processes (production processes, proposal processes, and personnel issues) that were not working well instead of blaming their frustration entirely on the reorganization.

(Conflict) As the requirement for coordination and cooperation between the project teams and competency centers increased, conflict did surface. This conflict has primarily been between the project teams and the competency centers in Beta. The project teams identified certain pathologies (Davis and Lawrence) within the competency centers. These pathologies included such issues as excess overhead (or indirect costs), decision strangulation within the CSTs (the need for all decision to be made by group consensus vice one consistent voice has lead to inconsistent processes procedures and multiple points of contact), and power struggles between project teams and competency centers for organizational assets (equipment and personnel). Part of the conflict within NAWC-ADI is due to the lack of clear boundry identification between the project office and the competency centers. This has resulted in confusion regarding the balance of power between project teams and competency centers. The project teams are now perceived as the power base within NAWC-ADI and the other directorates serve a support function. This implies that all

parts of the organization have not been fully integrated in the reorganization.

(Horizontal communication) The requirement for lower levels to communicate horizontally has certainly increased. This increased flow has not necessarily meant increased communication quality. The higher level managers have concentrated primarily on vertical corporate information, due, in part, to the importance of base closures and realignment. However, NAWC-ADI has not been able to identify a new communication network to align with its organizational network (structure). At the present time, communication appears to be flowing through the matrix structure (competency centers and project teams), but few people strongly support the idea that the quality of horizontal communication had improved. This could be the result of lower level employees not being familiar with communicating outside of the traditional vertical network. It could also relate to the negative feelings associated with the increased levels of conflict discussed above.

(Trip Wires) The "Trip Wires" identified by Hackman (1990) were recognized during the interviews. No method for evaluating team performance has been established. Team members are still evaluated individually. Generally, teams have been left to "work out the details" of self-management. This has been especially true for the customer service teams within the competency centers. Because sufficient resources

have not been provided to train employees on intra and inter team skills, the lower level teams have experienced the most frustration. As Hackman states, it cannot be assumed that teams have all the competence they need to work well as a team.

The following chapter will address recommendations to capitalize on NAWC's positive aspects and to assist with the challenges identified above. The chapter will also suggest areas for further research that would assist NAWC in moving toward full implementation of its reorganization.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. MANAGEMENT

NAWC has invested large amounts of time and effort to facilitate its reorganization. The greatest strength that NAWC has is its sincere desire to continue working on its organizational development. NAWC must concern itself with the influence of external factors as well as those internal to its organization. Any significant organizational change such as that instituted at NAWC-ADI will meet with resistance and difficulties in managing the transition phase. The major internal factors (both positive and negative) derived from the reorganization were described in the prior chapter. But, there are significant external factors also relevant to understanding both the status of this reorganization and the recommendations for future action.

Externally, the biggest issue facing NAWC is the reduction in forces or downsizing which is facing the entire Department of Defense. This issue involves the identification of excess personnel, the best manner to reduce, and the selection process for that reduction. This is not easy in that the only means available to NAWC at the present time is voluntary retirement or termination and an official reduction in force (RIF). A RIF may not provide for the exact personnel or

talents desired by NAWC, since the overriding criteria in a RIF is seniority. This could have an adverse effect in retaining the personnel best suited for NAWC's organizational structure and culture.

The downsizing by RIFs is directly related to the external control over NAWC by civil service rules and regulations. These rules not only pertain to the RIF, but affect all aspects of employee relations. The performance appraisal, promotion, and grievance systems are all externally controlled. To become more flexible, NAWC-ADI must find a way to modify or eliminate some of the civil service rules that are hindering organizational development. For example, the performance appraisal system must become more orientated to team functions and measurement of long term project/organization goals. At the present time, the best NAWC can hope for is to provide each individual with an accurate job description and an individual performance appraisal review. This does not reinforce the culture and value of the team concept as discussed by Hackman (1990).

The major reorganization of NAWC, Headquarters, Aircraft Division (NAWC-ADI's reporting senior) along the lines of that undertaken by NAWC, Indianapolis will have an impact of how NAWC-ADI will communicate with its chain of command and with its customers. Although NAWC-ADI has taken the lead in the Naval Air Systems Command on innovation and organizational design, the reality of military organizations is that senior

organizations in the chain of command tend to dictate to their juniors the appropriate mechanisms for conducting business. NAWC-ADI must be prepared to adjust to the new procedures imposed on them from higher command. This is not to say that they can not help in molding that relationship, but they (the organization and personnel) must be ready to change some of the policies that has been implemented over the past two years. Perhaps the greatest danger for NAWC-ADI would be if the NAWC, Headquarters, Aircraft Division's reorganization were to try to standardize the policies and procedures internal to all of the warfare centers. This could result in creating a new bureaucracy as limiting as the old one. They must continue to be flexible, while understanding the unique external constraints of a military organization.

Internally, the relationship between the project office and the competency centers, team development, conflict management, and strategic fit throughout the organization must be addressed. The organization's concept of operations needs to reinforce the different roles of the project office and the competency centers. Much of the frustration between these groups appears to result from a lack of clear understanding concerning the roles of each and the balance of power within the organization. Drawing from Katz and Allen (1985), NAWC-ADI needs to identify the specific roles of each directorate. Power can no longer be seen as who has the boss' ear, but must be contingent on the topic and area under discussion.

The importance of team development as discussed by Davis (1977) and Keller (1986) was presented in the literature review. Without group cohesiveness, project teams and customer service teams (CSTs) cannot be fully effective. NAWC-ADI has concentrated heavily on project team development. This is due to the fact that project teams did exist to some extent before the reorganization and that they are central to the customer focus of the new organization. However, the lagging emphasis on the CSTs contributed to the frustration and confusion that has developed between the project teams and the CSTs. Recognizing the limited attention given to clarifying level one's Concept of Operations, NAWC-ADI has established a study group to develop a level one Concept of Operations. The new Concept of Operations will provide the outline for establishing and operating of CSTs, but that will not ensure that the team will develop skills essential for success.

In line with the cautions provided by Hackman's "Trip Wires," NAWC needs to move away from the concept of individual training (i.e., 40 hours for each person) and concentrate on team skill development. Team members should not be treated as individuals and need to be reinforced through organizational supports. The project teams have learned a lot from trial and error, but both could improve their group cohesiveness by participating in specific training sessions built around group dynamics. The funds targeted for individual career and

technical development should be postponed until the gulf between team skills has been bridged.

A significant portion of the team development should concentrate on conflict management. Matrix organizations create an environment that allows conflicts to surface more often than more traditional organizations. As Barker (1988) pointed out, those managers who confirmed that conflict did exist and were co-operative in reaching team goals were more successful than those that avoided conflict or took a competitive approach to resolving it. NAWC-ADI has to acknowledge that their personnel are communicating more often and at a lower level than in the past. Even in an environment where the mutual goals of the organization are paramount, conflict will occur on the best ways to obtain those goals. Conflict management training will identify the reality of conflict in the new organization and provide the teams with the ability to handle conflict without escalating it higher in the organization.

After the level one Concept of Operations is developed, all of the concept of operations and policies should be compared. As the organization is focusing more on the specific dynamics at each level, it should not forget about the "gestalt." NAWC-ADI (using the Leverage Process) began its reorganization by identifying structure as the major constraint within the organization. Many changes have occurred over the past two years. A lot of those changes have

been in response to specific problems. An assessment of how well all of the parts fit into the organization is needed. The literature on systems models provide an excellent basis to examine the strategic fit or congruence at NAWC-ADI. What cultural changes have taken place or are still needed? What personnel development programs are seen as hindering or as helping to achieve the desired organizational climate? How is NAWC-ADI interacting with its external environment different than two years ago? NAWC-ADI's managers need to move away from the idea of one constraint and deal with the interaction between organizational components.

B. FURTHER RESEARCH

NAWC provides an interesting organization for further research. The change process itself requires further study, before the corporate information is lost. A case study on the reorganization would contribute to an understanding of the dynamics of change in a large organization in general and in a public sector organization in particular. Topics such as who led the change, what was the felt need, and how was the process initially carried out would contribute to the understanding of organizational change and resistance to change.

Research on specific processes would contribute to a better understanding of the interaction between organizational components in a public sector organization. An understanding

of the effect of unit costing and Defense Business Operations Funds (DBOF) would provide insight into the issues of direct and indirect funding at NAWC-ADI and military organizations. This could be extended to include a study of the ways in which the DBOF system acts as a driving force or hinderance to an organization (such as NAWC-ADI) trying to adjust to the new defense environment.

A study of the production management aspects at NAWC-ADI would facilitate a more comprehensive picture of process problems. Production management is the life blood of NAWC. If the end product is the purpose, then the production process is the how of an organization. The types of scheduling techniques, manufacturing software, inventory models and quality assurance procedures utilized at NAWC would help to determine if the organizational innovations have been superficial or have permeated the entire organization.

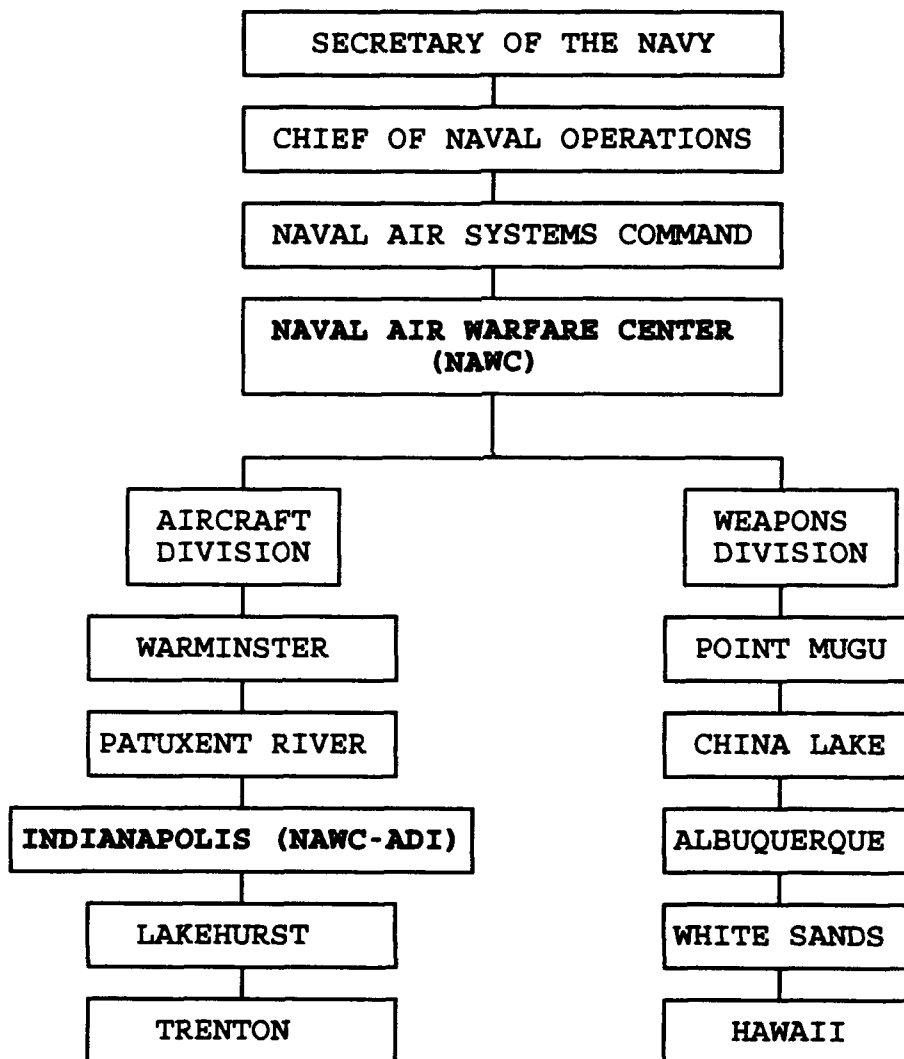
Additional research is needed on the personnel issues in a public sector organization that is no longer conducting itself in a traditional bureaucratic manner. How does a personnel system imposed on an innovative organization effect the change process? Is it treated as an external factor or as an internal constraint? Can bureaucratic civil service career patterns and complex grievance procedures coexist in a dynamic organization which is adjusting to customer demand?

Additional research is needed throughout the public sector (especially in the Department of Defense) to identify those

organizations that have attempted large scale change. The question for NAWC and the entire Department of Defense is how can a government organization become an organization that learns from and interacts with the clients or customers that it is designed to serve, while being controlled and directed by its political environment.

APPENDIX A

NAVY RDT&E WARFARE CENTERS ORGANIZATION CHART



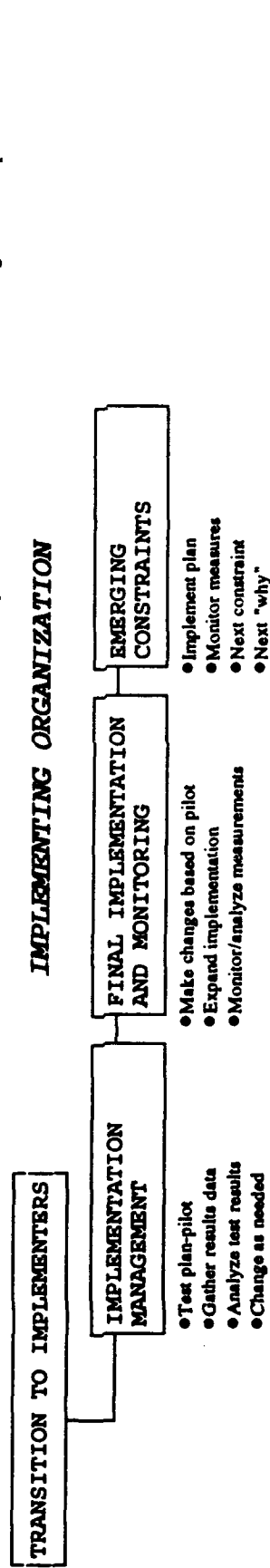
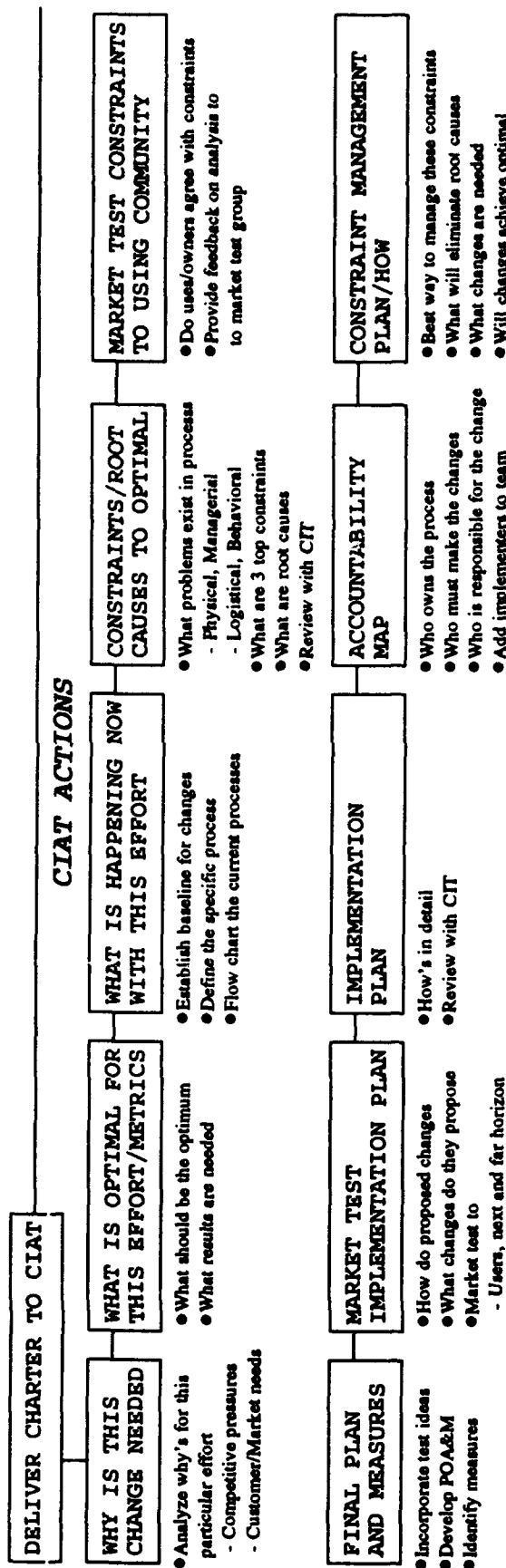
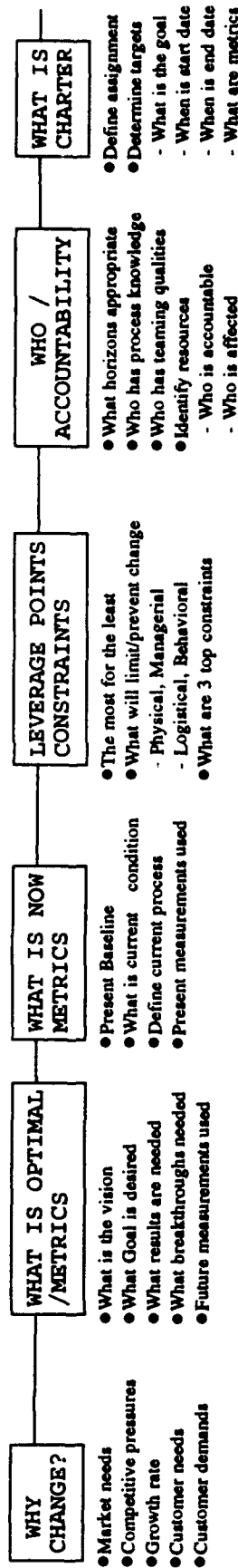
APPENDIX B
Naval Air Warfare Center, Aircraft Division, Indianapolis (NAWC-ADI)

CO, Exec Director, XO

Project Office	Alpha Directorate Avionic Elec Design	Beta Directorate Avionic Acq & Mfg	Gamma Directorate Fleet Support User	Command Staff
Commons Avionics	Systems Engineering	Acquisition	Product Technology	Group Ethics
Mission Avionics	Electronic Design	Elec Assy & Services	Integrated Log Support	Infrastructure Health
Systems & Platforms	Mechanical Design	Material Management	Product Assurance	Human Resources
Weapon Avionics	Software Engineering	Mech Devices & Assy	Product Eval/Qual	Group Communication
	Avionics Engineering	Acq & Mfg Technology	Fleet/User Liaison	Group Planning
	Design Specialties	Systems Assy/Test		Financial Mgt
	Design Service	Production Test Tech		
		Elec Wiring/Cabling		
		Acq Plan/Coordination		
		Advanced Electronics		

Source: "Organizational Concept of Operations Manual," Naval Air Warfare Center, 16 June 1992

APPENDIX C CONTINUOUS IMPROVEMENT TEAM (CIT) ACTIONS



APPENDIX D

INTERVIEW PROTOCOL

Level Three

Introductory Statement:

When a large-scale change occurs in an organization this size, members often have difficulty reading off the same page, understanding the strategies, policies, and procedures that top managers are generating. Often the top managers experience these misunderstandings as communication breakdowns. We would like to ask you some questions regarding your experience of communicating your intentions (by way of policies, procedures, strategies, decisions) to level 1 and level 2 people in the organization. We would also like to ask you some questions regarding decision making procedures in the organization in general. Basically, we want to understand 1.) how the larger vision is generated among top managers, 2.) what is working well when members are aligning themselves with the larger vision, and 3.) what gets in the way of members aligning themselves with the new vision for the organization. We would like you to be as specific as possible, that is to tell of concrete instances when you experienced the reorganization working well (e.g., times when participation in decision making was successful, when diverse groups participated in decision, when people felt empowered to initiate new actions, when people invested the time to seek consensus for a tough decision, times when innovative ideas were generated). Also, tell us of instances when things were not working so well.

Interview Questions:

1. Think of a time when the re-organization worked well. What was going on? Who in this organization has thrived under the new design?
(get success story in regards to how levels one and two performed)
(what are the indicators that things are working well?)
(what do you see as the communication strengths of the Center? -- what's working?)

2. When this study was initiated, there was a feeling among members of the LTD that there were problems with communication particularly as a result of the restructuring. What are the indicators that signal this for you? How will you know when communication problems have been resolved?

(what do you see as the communication weaknesses of the Center? -- what's not working?)

3. In general, what do you think about the way decisions get made around here since the re-organization?

(probe: what do you need to make good decisions, e.g., what info, input from others...)

4. How well do others in the organization (L1, L2, or even L3) understand decision/policies/strategies since the re-organization?

(how do they understand and support your intentions?)

(what are the indicators?)

(look for times when L2 and L3 understood or failed to understand...What happened or failed to happen?)

5. What do you hope to get out of this study?

Other possible probes:

One indicator could be productivity. What aspects of communication do you feel have the most significant impact on productivity?

Given the near horizon, mid horizon, and far horizon responsibilities of the three levels of the organization, how do these relate to the challenges in communication? What far horizon information needs to be communicated to L2 and L1? How is it being communicated? Is this effective? Same questions for mid horizon communications to L3 and L1, and near horizon communications to L2 and L3.

Levels Two and One

Introductory Statement:

When a large-scale change occurs in an organization this size, members often have trouble adjusting to the new requirements. Often everything that seemed familiar, like roles, reporting relationships, even simple work procedures are changed and more often than not this can cause confusion. We are interested in understanding how you have experienced this re-organization. In particular, we are interested in knowing when and how the new organization has worked well, when and how people are thriving under the new system. Also, we are interested in understanding what is not working well, what gets in the way of people's performance, what seems confusing, or hinders work flow. We will be asking you questions about your experience of this change process.

Interview Questions:

1. First of all, we would like you to think of a time when you experienced the organization working well as a result of the change. It could involve you personally, your work group, or someone else in the organization. What was going on? What made it successful?
2. What is the most difficult challenge you have experienced since the re-organization? What made it difficult?
3. What don't each of the other 2 groups understand about the way things work around here?

Other possible probes:

Areas of communication:

Far horizon

organizational mission, goals, longer term strategies

Mid horizon

policies, customer opportunities, human resource development, process improvements, new programs

Near horizon

task-related information, performance feedback, career development and advancement opportunities

Other probes continued:

1. Ways you can learn about these areas:
 - a. What information in these areas do you currently receive?
 - b. How do you receive it? From whom?
 - c. What additional information in these areas would you like to receive?
 - d. Who would the information come from?
 - e. Why do you think you aren't getting it now?
2. Ways you communicate about these:
 - a. What information in these areas are you responsible for communicating to others?
 - b. How and to whom?
 - c. How do you make the decision to initiate communication?
 - d. What requests for information do you receive?
 - e. What happens when you communicate across levels or teams (other directorates, project office, etc)? Are they responsive? Where is the greatest lag or block? Why?
3. Describe the communication relationship you have with:
 - a. Peers within your competency center
 - b. Peers within other competency centers
 - c. Project office
 - d. Other 2 levels
4. What are the communication strengths of the organization (what's working)?
5. What are the major communication weaknesses of the organization (what's not working)?
6. What would you like to see done to improve communication here?
 - a. Why hasn't it been done already?
 - b. What are the major obstacles?
7. How does communication here affect your productivity?

APPENDIX E

SORTING PROCEDURES

WordPerfect (5.1) has the capability of performing sorting operations. In combination with the blocking and copying options, the sorting function was utilized to arrange highlighted sections (topics) from the NAWC interviews.

To establish a topic file and to sort, certain prerequisites were required. First, the appropriate sections of the transcribed interviews were highlighted and coded. The codes were as follows: Topic (4 digit); Level (3 digit); Group (2 digit); Project (2 digit); Interviewee (2 digit); Interviewer (2 digit); and Interview Number (2 digit). The four digit topic code allowed for the first two digits to represent the general topic and the last two digits to represent subgroupings (ie., 1200 = Personnel Management, 1220 = Advancement/Career, 1230 = Performance Evaluations). Second, the computer file was required for each interview. The code numbers and highlighted sections could have been manually inputted into a separate data file and then sorted by the methods listed below. However, utilizing the procedures outlined below, the data was transferred directly from the interview file to the newly created topic file. The procedures presented below can be found in the WordPerfect Workbook, which comes with the software program, or most commercial how-to computer books written about WordPerfect (5.1).

Procedures to create and sort a topic file.

1. Access an interview from the data file.
2. Split the computer screen. (Cntl F3, 1=Window, 12=Number of lines, Enter)
3. Move cursor to bottom screen. (Shift F3)
4. Type line of code for first quote and hit Enter. The codes need to be separated by a tab (for example, 1200 3PL 14 05). (See a reference book for definition of lines and fields.)
5. Move cursor to top screen. (Shift F3)
6. Locate the appropriate passage to be transferred and highlight using the block option. (Alt F4) Move cursor until the entire section is high lighted.
7. Copy the highlighted section to the bottom screen. (Cntl F4, 1=block, 2=copy, Shift F3 moves cursor to bottom screen, Enter copies the text in the new position)

8. Move cursor to end of text and hit Enter twice.
(Paragraph sort requires double spacing between text to distinguish data input.)
9. Type in the code for the next quote and repeat numbers 4-8 until all sections of the interview have been completed. (A sort can be performed after each interview or after a number of interviews.)
10. After all quotes have been copied from a particular interview, move to the top screen and exit. (Shift F3, F7, Y=Save document, Enter=Document saved under previous name, Y=Replace previous file, Y=Exit document 1).
11. Close top screen. (Shift F3 to move cursor to bottom screen, Cntl F3, 1=Window, 0=Number of lines, Enter)
12. Save new topic file. (F10, type in appropriate drive:name)
13. Begin sort process. (Cntl F9, 2=Sort, Enter=Input file to sort:(screen), "new drive:file name"=Output file for sort:)
14. Input sort characteristics. (7=Type sort, 3=Paragraph sort; 6=Order, A=Ascending; 3=Key, A=Alphanumeric type, 1=Line, 1=Field, 1=Word, F7=Exit) (Sort can be performed on up to nine separate keys)
15. Perform sort. (1=Perform action)
16. Exit topic file. (F7, Y=Save document, Enter=Save under existing name, Y=replace original topic file, N=Not exit WordPerfect)
17. Access sorted topic file. (F5, "drive:"=drive file is stored on, Enter=Go to drive directory, move cursor to appropriate file and hit 1 to recall data file to screen)
18. Print sorted topic file. (Shift F7, 1=Full document, other options are available)
19. Exit sorted topic file. (Repeat procedures in item 15, except change N to Y=exit WordPerfect)

APPENDIX F
NAWC Indianapolis Communication Matrix (Downward Flow)

Who needs to know?	What do they need to know?	Tell them via? ¹	Who is responsible for informing them?
AGO/CS Dirs (Far Horizon)	*Corporate issues/information *Support/operations issues	*VTC debrief/corp board mtg *AGO/CS Dirs mtg	*00/03 *AGO/CS Dirs
Other far horizon (L3 associates/PPs) Mid Horizon (L2 CCDs/PALs)	*Corp issues/info *Issues specific to their areas (PIA, PDA, MS, TECH) *Policies, guidance on problems/constraints previously elevated	*AGO/CS Dirs mtg w/PPs/associates/CCDs/PALs	*AGO/CS Dirs
Other mid horizon (L2 associates) Near horizon reps (PLs, CST reps, etc)	*Corp issues/info *Issues specific to their areas *Policies, guidance on problems/constraints previously elevated	*CCDs/PALs meet w/near horizon group *Far horizon (L3 associates) meet w/mid horizon associates ²	*CCDs/PALs *Far horizon associates
Near horizon (all remaining NAWC Indianapolis team members)	*Corp issues/info *Policies, guidance on problems/constraints previously elevated	*Project team mtgs *CST mtgs *Work group mtgs	*PLs *CST reps *Work group reps

¹ At regularly scheduled meetings or as determined by urgency of information.

² Not exclusive

LIST OF REFERENCES

- Ancona, D.G., "Outward Bound: Strategies for Team Survival in an Organization," Academy of Management Journal, Vol. 33, No. 2, pp. 334-365.
- Ancona, Deborah Gladstein, and David Caldwell, "Improving the Performance of New Product Teams," Research-Technology Management, March-April, 1990.
- Barker, J., Tjosvold, D., and Andrews, I. R., "Conflict Approaches of Effective and Ineffective Project Managers: A Field Study in a Matrix Organization," Journal of Management Studies, Vol. 25, No. 2, March 1988, pp. 167-178.
- Bartlett, C.A. and Ghoshal, S., "Matrix Management: Not a Structure, a Frame of Mind," in Managing People and Organizations, J.J. Gabarro (Ed.), Boston, MA, Harvard Business School, 1992, pp. 370-381.
- Beer, M.A., "Leading Change," Harvard Business School, Vol 9-488-037, Harvard Business School, Boston, MA, pp. 1-7.
- Bridges, William, Surviving Corporate Transition: Rational Management in a World of Mergers, Start-ups, Takeovers, Layoffs, Divestitures, Deregulation and New Technologies, Mill Valley, CA, William Bridges and Associates, CA, 1990.
- Bryson, J.M., Strategic Planning for Public and Nonprofit Organizations, San Francisco, CA, Jossey-Bass Publishers, 1988, pp. 46-71.
- Burns, L.R. and Wholey, D.R., "Adoption and Abandonment of Matrix Management Programs: Effects of Organizational Characteristics and Interorganizational Networks," Academy of Management Journal, Vol. 36, No. 1, February 1993, pp. 106-138.
- Byron, R., J. Holmgren, G. Houglan, and J. Jacobs, Employee Feedback Survey, Naval Air Warfare Center, Indianapolis, " (Monterey, CA: Department of Administrative Sciences, Naval Postgraduate School, 1993), photocopied.
- Davis, S.M. and Lawrence, P.R., Matrix Reading, MA, Addison-Wesley Publishing Company, 1977, pp. 1-146.

- Donnelly, James H., James L. Gibson, and John M. Ivancevich, Fundamentals of Management, Boston, MA, Irwin, 1992.
- Downs, Cal W., Communication Audits, Glenview, IL, Harper Collins, 1988.
- Ford, D.J., An Evaluation of Organizational Effectiveness at the Naval Air Warfare Center, Aircraft Division, Indianapolis, Master's Thesis, Naval Postgraduate School, Monterey, CA, September 1993.
- Gist, M.E., Locke, E.A., and Taylor, M.S., "Organizational Behavior: Group Structure, Process, and Effectiveness," Journal of Management, Vol. 13, No. 2, 1987, pp. 237-257.
- Glaser, B.G., Theoretical Sensitivity, Mill Valley, CA, The Sociology Press, 1978.
- Goodman, P.S., E. Ravlin, and M. Schminke, "Understanding Groups in Organizations," In L.L. Cummings and B.M. Staw (Eds.), Research in Organizational Behavior, Vol.9, Greenwich, CT, Jai Press, 1987
- Hackman, J.R., Groups That Work (and Those That Don't): Creating Conditions for Effective Teamwork, San Francisco, CA, Jossey-Bass Publishers, 1990.
- Hackman, J.R., Greg Oldham, Robert Janson, Kenneth Purdy, "A New Strategy For Job Enrichment," California Management Review, Summer 1975, pp.57-71.
- Hackman, J.R. and G.R. Oldham, Work Redesign, Reading, MA, Addison-Wesley, 1980.
- Hackman, J.R., "The Design of Work Teams," In Handbook of Organizational Behavior, J Lorsch (Ed.), Englewood Cliffs: NJ, 1983, pp. 315-342.
- Henry, N., Public Administration and Public Affairs, Englewood Cliffs, NJ, Prentice Hall, Inc., 1989, pp. 52-53.
- Hocevar, Susan P., Quality of Work Life 1992 Survey, Monterey, Ca: Department of Administrative Sciences, Naval Postgraduate School, 1993), photocopied.
- James, L.R. 1982. Aggregation Bias in Estimates of Perceptual Agreement," Journal of Applied Psychology, 67: pp. 219-229.
- Joyce, W.F., "Matrix Organization: A Social Experiment,"

Academy of Management Journal, Vol. 29, No. 3, September 1986, pp. 536-561.

Katz, R. and Allen, T.J., "Project Performance and the Locus of Influence in the R & D Matrix," Academy of Management Journal, Vol. 28, No. 6, March 1985, pp. 67-87.

Keller, R.T., "Predictors of the Performance of Project Groups in R & D Organizations," Academy of Management Journal, Vol. 29, No. 4, pp. 715-726.

Koch, J.L., "Effects of Goal Specificity and Performance Feedback to Work Groups on Peer Leadership, Performance and Attitudes," Human Relations, 1979, 32, pp.819-840.

Lawler, Edward E. III., High Involvement Management, San Francisco, CA, Jossey- Bass Publishers, 1986.

Lippitt, G.L., Langseth, P., and Mossop, J., Implementing Organizational Change, San Francisco, CA, Jossey-Bass Publishers, 1985, pp. 1-26.

Manz, Charles C, David E. Keating, Anne Donnellon, "Preparing for an Organizational Change to Employee Self-Management," In William A. Pasmore and Richard P. Woodman (Eds.) Research in Organizational Change and Development, Vol.4, Jai Press, CT, 1990.

Mintzberg, H., Structure in Fives: Designing Effective Organizations, Englewood Cliffs, NJ, Prentice-Hall, Inc., 1983, pp. 151-280.

Nadler, D.A. and Tushman, M., "A Congruence Model for Diagnosing Organizational Behavior," in The Organizational Behavior Reader, David A. Kolb, Irwin M. Rubin, and Joyce S. Osland (Eds.) Englewood Cliffs, NJ, Prentice Hall, Inc., 1991, pp. 544-561.

Naval Avionics Center Continuous Improvement Process Division, Training in the Leverage Change Process: Meeting the Challenge of the '90s, Indianapolis, IN 1992, pp. 8-11.

Nickerson, Arlene, Management Directions for the 21st Century, The Leverage Company, Greenwich, CT, p.1

O'Keefe, R.D., J.A. Kernaghan, and A.H. Rubenstein, "Group Cohesiveness: A Factor in the Adoption of Innovations Among Scientific Work Groups," Small Group Behavior, 1975,6, pp.282-292.

- O'Reilly, C.A., and K.H. Roberts, "Task Group Structure, Communication, and Effectiveness in Three Organizations," Journal of Applied Psychology, 1977, 62, pp.674-681.
- Sundstrom, E., De Meuse, K.P., and Futrell, D., "Work Teams: Applications and Effectiveness," American Psychologist, Vol. 45, No. 2, February 1990, pp. 120-133.
- Tichy, N.M., Managing Strategic Change: Technical, Political and Cultural Dynamics, New York, NY, John Wiley & Sons, 1983, pp. 3-145.
- Uhl-Bien, Mary and George B. Graen, "Self-Management and Team-Making in Cross-Functional Work Teams: Discovering the Keys to Becoming an Integrated Team," Journal of High Technology Management, 1991.
- Whyte, W.F., and Hamilton, E.L., Action Research for Management, Homewood, IL, Richard D. Irwin, Inc., 1964.

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